URBAN/MUNICIPAL
CA3 ON HW Q90
89 C51

CONTRACT FOR CONSTRUCTION OF A LANDFILL GAS CONTROL SYSTEM AT UPPER OTTAWA STREET LANDFILL SITE

CA30N HW Q90
89 C51

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH

CONTRACT FOR CONSTRUCTION OF A LANDFILL GAS CONTROL SYSTEM AT UPPER OTTAWA STREET LANDFILL SITE

Contract No. RHW 89-10(G)

January 1989
Ref. 2239

CONESTOGA-ROVERS & ASSOCIATES

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REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH

LIST OF CONTRACT DOCUMENTS

FOR

CONTRACT NO. RHW 89-10(G)

The following shall form the Contract Documents:

Addenda numbered _____ to ______

List of Contract Documents

List of Contract Drawings

° Manual of Standard Specifications and Drawings, Book "A" and "B", the Current Edition of which has: - Book "A" Index dated March 30, 1987. Book Book "B" - Indexes to Roadway, Sewer and Water Works Standard Drawings

° Ontario Provincial Standard Specifications; # Ontario Provincial Standard Drawings

Tender Notice

Contract for Works (RHW Form 003)

Performance Bond and Labour and Material Payment Bond

Form of Tender (RHW Form 002) Including Schedule of Quantities and Prices

Supplementary Instructions to Bidders

Special Provisions

Special Provisions Respecting Contingency Allowance

Special Provisions Respecting Time to Complete Work

Special Provisions Respecting Federal and Ontario Retail Sales Tax

° These Standard Specifications and Drawings are not bound in the Contract Documents:

Manual on Standard Specifications and Drawings, Book "A" and "B" are available for a fee of Sixty ($75.00) Dollars from the Regional Department of Engineering, 6th Floor, City Hall, Hamilton.

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH

CONTRACT NO. RHW 89-10(G)

LIST OF CONTRACT DRAWINGS

NOTE: The Drawings listed herein below form a compliment to the specifications governing the work in this Contract. The Drawings illustrate generally, and in detail, the nature of the work to be performed.

DRAWING NO.	SHEET NO.	DESCRIPTION
89-M-1	1	Existing Conditions
89-M-1	2	General Site Plan
89-M-1	3	Header Pipe Chainage STA 0+000 to STA 0+295
89-M-1	4	Header Pipe Chainage STA 0+295 to STA 0+513
89-M-1	5	Profiles Along Subheaders
89-M-1	6	Vertical Well and Subheader Details
89-M-1	7	Condensate Trap Chamber Details
89-M-1	8	Gas Plant Compound, Layout and Details
89-M-1	9	Building Layout and Elevations
89-M-1	10	Foundation and Structural Details
89-M-1	11	Blower Room Mechanical
89-M-1	12	Mechanical - Flare and Piping
89-M-1	13	Miscellaneous Details
89-M-1	14	Electrical Site Service and Building Layout
89-M-1	15	Electrical Schematics and Details

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH

DEPARTMENT OF ENGINEERING

TENDER NOTICE

CONTRACT NO.: RHW 89-10(G)

Sealed tenders for the above, as specified herein, will be received up to 11:00 a.m. (local time)

Wednesday, March 1, 1989 c/o Regional Clerk, 15th Floor, 119 King Street West, Hamilton.

Public tender opening at 11:00 a.m. in the committee room of the Regional Clerk's office.

i) All tenders must be filed on the date specified.

ii) Tenders received later than the time specified will not be accepted regardless of the postal cancel date.

iii) Instruction to Bidders - Refer to RHW Form 100.

CONTRACT FOR WORKS

THIS AGREEMENT made the day of one thousand, nine hundred and

BETWEEN ....

....

....

(hereinafter called the "Contractor")

and THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH

(hereinafter called the "Region")

WITNESSETH, that the said Contractor covenants and agrees with the said Region that in consideration of the payments to be made by the said Region in manner and at the times hereinafter mentioned, that the said Contractor will do and perform the whole of the works and manufacture, furnish, supply, deliver and install the materials or equipment hereinafter mentioned, with due expedition and in a thoroughly workmanlike manner, in strict accordance with the Tender, Manual of Standard Specifications and Drawings, including Special Provisions and addenda, letters related thereto hereunto annexed and the drawings therein referred to, all of which are made part of this contract as if embodied herein and will furnish all materials, tools, plant, machinery, labour, and workmanship required for the said works, together with transportation of the same, and all other things necessary for the due and proper execution of the said works in manner aforesaid and will do all such work and furnish all such materials according to the directions and to the satisfaction of the Engineer for the time being of the said Regional Municipality of Hamilton-Wentworth.

.01 The Works referred to in this Agreement consist of;

Contract No. RHW-89-10 (G)

Construction of A Landfill Gas Control System at

the Upper Ottawa Street Landfill Site

....

.02 The said Contractor agrees that he/it will commence the said works when required and ordered by the Commissioner of Engineering, and will proceed therewith at a rate satisfactory to the Commissioner of Engineering, and will complete the same within time prescribed in "Time for Completion and Liquidated Damages" after notification from the Commissioner of Engineering to proceed with the work and that if the said works shall not have been completed or said materials supplied and delivered when ordered before that date the said Contractor will pay to the said Region the sum prescribed in "Time for Completion and Liquidated Damages", for every working/calendar days beyond the date of the said works shall remain incomplete, which amount may be recovered as a debt, or may be set-off against any money payable under this contract or otherwise.

.03 It is hereby provided and agreed that if the said Contractor shall fail or default in any way in the performance of the covenants herein contained, or shall neglect to perform the said work and furnish materials therefore or deliver the supplies when ordered to the satisfaction of the Commissioner of Engineering, or to proceed with the work with such despatch as he shall require, then and in every such case, it shall any may be lawful for the said Region and they are hereby empowered, to enter upon, and complete the said works, and for that purpose to take possession of all plant, machinery, tools and materials provided therefore by the Contractor, or to enter into a contract with any other person or persons who may agree to execute such works, or deliver such supplies and further that the said Contractor shall forfeit and pay to the Region the difference, if any, between the price the said Region may have to pay for the completion of such works and delivery of such supplied and the price herein agreed to be paid, or in the alternative, the Region may in the event of such failure or default act under the Performance Bond posted herein, and such action may be in addition to the rights of the Region as aforesaid.

.04 The said Region covenants with the said Contractor that if the said work shall be duly and properly executed and materials provided as aforesaid, according to the directions of the said Engineer and to his satisfaction within the period aforesaid, and if the said Contractor shall observe all the provisions, terms and conditions of this contract, they, the said Region will pay the said Contractor, for the said work and materials, and for all articles or equipment supplied and delivered the price or sum of

....

($ ____________________)

.04 Cont'd .. ..

in accordance with the terms of payment in the special provisions and general conditions upon progress or interim certificates signed by the said Engineer, provided that no money shall become due or be payable under this contract unless or until a certificate that such money is due to the Contract shall have been signed by the said Engineer, the possession of which certificate is hereby made a condition precedent to the Contractor's right to be paid or to maintain any action for such money or any part thereof.

.05 And the Contractor convenants with the Region that he/it will from time to time, and at all times, indemnify and save harmless, the Region from and against all claims, demands, law suits, expenses, damages, injuries, actions, cause of actions, suits, interest, liens and costs whatsoever on account of the said works, or on account of the non-delivery of the said articles or equipment or materials, or on account of the installation or building of the said works, or which may be incurred by reason of or in consequence of the execution or non-execution or defective or negligent execution thereof, or the supply or non-supply of any plant or material thereof, and shall pay to the Region on demand, any and all expenses, losses, costs, interest, payments, or damages which may be sustained by it by reason of or in consequence of any such actions, suits, claims, demands, liens, injuries or causes of action, and any monies paid by the Region in settlement or discharge thereof, or on account thereof, maybe deducted from any monies payable to the Contractor, in the hands of the Region, on account of this contract, or may be recovered from the Contractor as monies paid at his/its request; and the Contractor agrees to pay to the Region on demand its reasonable costs of defending, negotiating or settling any such suits, claims, demands, actions, causes of actions or liens as they may in their discretion deem so to do, and such monies may be deducted from any monies payable by the Region to the Contractor held by the Region on any account of the Contractor whatsoever. And further, any petition in Bankruptcy of the Contractor or other Assignment or Liquidation for the benefit of Creditors shall be deemed to be a default by the Contractor under this contract, and any lien unpaid after demand to pay therefor within five days, by the Region, other than a lien of the Contractor, registered against the lands affected by this contract, shall be deemed to be a default by the Contractor under this Contract. The indemnity of the Contractor in this paragraph shall be deemed to be in addition to and not in lieu of any contract for indemnity for Insurance held by the Region which may affect this contract.

.06 All workmen, except indentured or other bona fide apprentices, employed in the performance of the work mentioned in these specification shall be paid at a rate of wages not less than those shown on the current City of Hamilton Wage Schedule for Various Building Trades as Applied to City Tenders and As Agreed Upon By Union Agreement Or As Recognized By the Hamilton Building Contractors' Association, Organization, or Trades, which Schedule is to be considered as a term of this Contract.

.07 The said Region shall be at liberty to pay any moneys due or to become payable under this contract in or towards payment of any wages or other moneys which may be owing by the Contractor to any workmen or sub-contractors or other persons for work done in connection with this contract, or of any moneys which may be owing for materials supplied for the works hereby contracted for; and, before payment of any moneys under this contract the Region may require the Contractor to make a statutory declaration as to what moneys, if any, are owing for such wages, work or materials, or that the same have all been fully paid.

IN WITNESS WHEREOF the said parties have hereunto affixed their Seals,

Signed, Sealed and Delivered
in the presence of

FOR:

....
Name of Contractor

....
Authorized Signature(s)

....
(Witness)

....

....
Date

FOR THE REGIONAL MUNICIPALITY OF
HAMILTON-WENTWORTH

....
Regional Chairman

....
Regional Clerk

....
Commissioner of Finance

....
Approved
Department of Engineering

....
Commissioner of Engineering

....
Date

PERFORMANCE OF CONTRACT BOND

KNOW ALL MEN BY THESE PRESENTS THAT

as Principal,

hereinafter called the Principal, and

as Surety,

hereinafter called the Surety, and held and firmly bound unto

as Obligee,

hereinafter called the Obligee, in the amount of

Dollars.

($) lawful money of Canada, for the payment of which sum, well and truly to be made, the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS the Principal has entered into a written contract with the Obligee, dated the day of 19 , for

in accordance with the plans and specifications submitted therefore which contract, plans and specifications and amendments thereto, to the extent herein provided for are by reference made part hereof and are hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Principal shall promptly and faithfully perform all stipulations and agreements in said Contract then this obligation shall be null and void: otherwise it shall remain in full force and effect.

Whenever Principal shall be, and declared by Obligee to be in default under the Contract, the Obligee having performed Obligee's obligations thereunder, the Surety may promptly remedy the default, or shall promptly

(1) Complete the Contract in accordance with its terms and conditions, or

(2) Obtain a bid or bids for submission to Obligee for completing the Contract in accordance with its terms and conditions, and upon determination by Obligee and Surety of the lowest responsible bidder, arrange for a contract between such bidder and Obligee and make available as work progresses (even though there should be a default or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the contract price", as used in this paragraph, shall mean the total amount payable by Obligee to Principal under the Contract, less the amount properly paid by Obligee to Principal.

No right of action shall accrue on this Bond to or for the use of any person or corporation other than the Obligee named herein or the heirs, executors, administrators, or successors of Obligee.

IN TESTIMONY WHEREOF, the Principal has hereto set its hand and affixed its seal, and the Surety has caused these presents to be sealed with its corporate seal duly attested by the signature of its Attorney-in-fact, this day of 19 .

Principal

Surety

LABOUR AND MATERIAL PAYMENT BOND
(Trustee Form)

NOTE: This Bond is issued simultaneously with another Bond in favour of the Obligee conditioned for the full and faithful performance of the Contract.

KNOW ALL MEN BY THESE PRESENTS THAT

as Principal, hereinafter called the Principal, and
a corporation created and existing under the laws of Canada and duly authorized to transact the business of Suretyship in Canada as Surety, hereinafter called the Surety are, subject to the conditions hereinafter contained, held and firmly bound unto

as Trustee, hereinafter called the Obligee, for the use and benefit of the Claimants, their and each of their heirs, executors, administrators, successors and assigns, the amount of

dollars ($)

of lawful money of Canada for the payment of which sum well and truly to be made the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a written contract with the Obligee, dated the
day of 19 , for

which contract, Specifications and Drawings are by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Principal shall make payment to all Claimants for all labour and material used or reasonably required for use in the performance of the Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

(1) A Claimant for the purpose of this Bond is defined as one having a direct contract with the Principal for labour, material, or both, used or reasonably required for use in the performance of the Contract, labour and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment directly applicable to the Contract provided that a person, firm or corporation who rents equipment to the Principal to be used in the performance of the Contract under a contract which provides that all or any part of the rent is to be applied towards the purchase price thereof, shall only be a Claimant to the extent of the prevailing industrial rental value of such equipment for the period during which the equipment was used in the performance of the Contract. The prevailing industrial rental value of equipment shall be determined, insofar as it is practical to do so, in accordance with and in the manner provided for in the latest revised edition of the publication of the Canadian Construction Association titled "Rental Rates on Contractors Equipment" published prior to the period during which the equipment was used in the performance of the Contract.

(2) The Principal and the Surety, hereby jointly and severally agree with the Obligee, as Trustee, that every Claimant who has not been paid as provided for under the terms of his contract with the Principal before the expiration of a period of ninety (90) days after the date on which the last of such Claimant's work or labour was done or performed or materials were furnished by such Claimant, may as a beneficiary of the trust herein provided for, sue on this Bond, prosecute the suit to final judgment for such sum or sums as may be justly due to such Claimant under the terms of his contract with the Principal and have execution thereon. Provided that the Obligee is not obliged to do or take any act, action or proceeding against the Surety on behalf of the Claimants, or any of them to enforce the provisions of this Bond. If any act, action or proceeding is taken either in the name of the Obligee or by joining the Obligee as a party to such proceeding, then such act, action or proceeding, shall be taken on the understanding and basis that the Claimants or any of them who take such act, action or proceeding shall indemnify and save harmless against all costs,

charges and expenses or liabilities incurred thereon and any loss or damage resulting to the Obligee by reason thereof. Provided still further that subject to the foregoing terms and conditions, the Claimants, or any of them, may use the name of the Obligee to sue on and enforce the provis of this Bond.

(3) No suit or action shall be commen hereunder by any Claimant:

(a) unless such Claimant shall have given written notice within the time limits hereinafter set forth to each of the Principal, the Surety and the Obligee, stating with substantial accuracy the amount claimed. Such notice shall be served by mailing the same by registered mail to the Principal, the Surety and the Obligee, at any place where an office is regularly maintained for the transaction of business by such persons or served in any manner in which legal process may be served in the Province or other part of Canada in which the subject matter of the Contract is located. Such notice shall be given

(1) in respect of any claim for the amount or any portion thereof, required to be held back from the Claimant by the Principal, under either the terms of the Claimant's contract with the Principal, or under the Mechanics' Liens Legislation applicable to the Claimant's contract with the Principal, whichever is the greater, within one hundred and twenty (120) days after such Claimant should have been paid in full under the Claimant's contract with the Principal:

(2) in respect of any claim other than for the holdback, or portion thereof, referred to above, within one hundred and twenty (120) days after the date upon which such Claimant did, or performed the last of the work or labour or furnished that the last of the materials for which such claim is made, under the Claimant's contract with the Principal;

(b) after the expiration of one (1) year following the date on which the Principal ceased work on the Contract, including work performed under the guarantees provided in the Contract:

(c) other than in a Court of competent jurisdiction in the Province or District of Canada in which the subject matter of the Contract, or any part thereof, is situated and not elsewhere, and the parties hereto agree to submit to the jurisdiction of such Court.

(4) The Surety agrees not to take advantage of Article 1959 of the Civil Code of the Province of Quebec in the event that, by an act or an omission of a Claimant, the Surety can no longer be subrogated in the rights, hypothecs and privileges of Said Claimant.

(5) The amount of this Bond shall be reduced by, and to the extent of any payment or payments made in good faith, and in accordance with the provisions hereof, inclusive of the payment by the Surety of Mechanics' Liens which may be filed of record against the subject matter of the Contract, whether or not claim for the amount of such lien be presented under and against this Bond.

(6) The Surety shall not be liable for a greater sum than the specified penalty of this Bond.

IN WITNESS WHEREOF, the Principal and the Surety have Signed and Sealed this Bond this day of 19

SIGNED AND SEALED
In the presence of

....

Witness as to Principal Principal

THE GUARANTEE COMPANY OF
NORTH AMERICA

....

RHW FORM:	002
DATE:	81.03.01
PAGE NO.:	1 of 5

FORM OF TENDER

....
(Name of Contract/Project)

Tender by:

Name: ....

Incorporated Under the Laws of: ....
(Specify Province, Canada or otherwise)

Business Address: ....

Head Office Address: ....

To

.01 Contract Price

I/We the undersigned, having examined the locality and site of work as well as all the Contract Documents, hereby tender and offer to enter into a contract to furnish all material and to perform and complete all the work in accordance with Contract Documents to the satisfaction of the Engineer and to comply with all conditions specified therein, at and for the price or sum shown on the attached Schedule of Prices on a Unit Price Basis for the total Contract Price of:

..../ Dollars

($ ....)

.02 Quantities

The total Contract Price is compiled from the Schedule of Quantities and Prices included in this Form of Tender. The quantities in the Schedule are approximate. I/We agree that the final valuation will be made on the basis of quantities measured during and on completion of the work at the prices in the Schedule.

.03 Completion

I/We agree to complete the work within the prescribed "Time to Complete Work and Liquidated Damages".

.04 Addenda

I/We acknowledge that we have received Addenda numbered ____________ to ____________ inclusive, and the Tender Price includes the provision set out in such Addenda.

.05 Contract

It is understood and agreed that a binding contract exists upon acceptance of this Tender by Regional Council and that subsequent execution of the contract documents is a formality and not a condition precedent to the existance of a binding contract. The documents listed in the List of Contract Documents for this contract/project shall constitute the Contract.

.06 Execution

If this Tender is accepted and contract awarded to me/us, I/We hereby agree to execute the contract, in triplicate, within ten (10) days of notification of acceptance of tender, and upon such execution to provide a Performance of Contract Bond and a Labour and Materials Bond in an amount equal to fifty percent (50%) of the amount of the tender.

.07 Bid Bond

A bid bond or certified cheque in the amount of $ 40,000.00 ....must be submitted with this tender.

In the event of default of failure on my/our part to execute the contract as above prescribed and to provide therewith the necessary Performance of Contract Bond, the Region shall declare the Bid Bond forfeited, and the Bonding Company shall forthwith pay to the Region an amount equal to the amount of the required bid bond. Upon such default, the Region shall be at liberty to accept the next lowest of any tender, and to advertise for new tenders, or to carry out the works in any manner deemed in the best interests of the Region, and I/We hereby agree to pay the said Region the difference between my/our Tender herewith and any greater sum which the Region may be obligated to pay by reason of such default or failure including the cost of any advertising for new tenders; and generally to indemnify and save harmless the said Region and their officers from all loss and damage, costs, charges and expenses which they may suffer by reason of such default or failure on my/our part.

.08 Time Open For Acceptance

This offer is irrevocable for sixty (60) days from the date of this offer, following which period of time, the Region may treat the offer as revoked and be free to re-tender the said works.

RHW FORM: 002
DATE: 85.10.10
PAGE NO.: 5 of 5

OFFERED ON BEHALF OF:

NAME OF TENDERER

SEAL

ADDRESS OF TENDERER

WITNESS

AUTHORIZED SIGNATURE(S)

All blanks must be carefully filled in, or the Tender will be declared "Not in Form".

NOTICE

A) The Region reserves the right to reject any, or all bids submitted, or any part and the lowest of any bid will not necessarily be accepted.

B) Tenderers are reminded that the contract documents to be executed contain a two (2) year maintenance clause which will be strictly enforced.

Reference No. 2239-50

FORM OF TENDER

THE REGIONAL MUNICIPALITY
OF
HAMILTON-WENTWORTH

CONTRACT NO. RHW 89-10(G)

SCHEDULE OF QUANTITIES AND PRICES

Location: Upper Ottawa Landfill Site, Hamilton

Description: Construction of a Landfill Gas Control System

Spec. No. refers to the Division of the Project Specifications.

Item No.	Spec No.	Description	Unit	Estimated Quantity	Unit Price	Amount
1.	02001	Gas Extraction Wells	m	432		
2.	02050	Demolition	lump sum	--	--	
3.	02443	Chain Link Fences Gates	m	110		
4.	02700	Piped Utilities				
		a) 315 mmø gas header	m	310		
		b) 250 mmø gas header	m	110		
		c) 200 mmø gas header	m	120		
		d) 150 mmø subheader	m	1600		
		e) subheader/vertical well connections	each	28		
		f) 100 mmø condensate drain	m	70		
		g) 20 mmø water line	m	265		
5.	02700	Precast Condensate Chambers				
		a) 2400 mmø chamber	each	1		
		b) 1800 mmø chamber	each	1		

Reference No. 2239-50

Item No.	Spec No.	Description	Unit	Estimated Quantity	Unit Price	Amount
6.	03000	Concrete	lump sum	--		
7.	09900	Painting	lump sum	-		
8.	13121	Pre-engineered Building	lump sum	--		
9.	13560	Incineration System	lump sum	--		
10.	15000	Mechanical	lump sum	--		
11.	16000	Electrical	lump sum	--		
		Total Contingency Allowance				$80,000
		Total Amount of Tender				$

(I)(we) have received and allowed for addenda numbered _____ to _____ in preparing (my), (our) Tender Prices for the work.

Reference No. 2239-50

FORM OF TENDER

THE REGIONAL MUNICIPALITY
OF
HAMILTON-WENTWORTH

CONTRACT NO. RHW 89-10(G)

SCHEDULE OF PROVISIONAL QUANTITIES AND PRICES

Location: Upper Ottawa Landfill Site, Hamilton

Description: Construction of a Landfill Gas Control System

Spec. No. refers to the Division of the Project Specifications.

Item No.	Spec No.	Description	Unit	Estimated Quantity	Unit Price	Amount
1.	02001	Gas Extraction Wells - unit price will be applied to additions or deletions in the well depth as a result of drilling refusal or other subsurface conditions subject to written approval by the Engineer.	m	80		
2.	16000	Underground Electrical Service - the unit price is for the additional cost per metre to install an underground electrical service and telephone line in lieu of the overhead services.	m	700		

The Region reserves the right to award a Contract incorporating the provisional items as noted above. The provisional amounts are in addition to the Total Contract Price indicated on the Form of Tender.

CONTRACT NO. RHW 89-10(G)

LIST OF SUBCONTRACTORS

WORK TO BE DONE	NAME AND ADDRESS OF PROPOSED SUBCONTRACTORS

In order to validate his Tender, the Tenderer must list all subcontractors that he intends to employ on this Contract.

No changes will be allowed after acceptance by the Region without the written consent of the Engineer.

ID. 0038D

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH

SPECIFICATIONS BOOK "A"

1. RHW Form 300, page 21.

Revise the first paragraph to read:

"The Region will pay the Contractor for labour and supervision employed on the work, at the rate of 135% on the first $1,000.00 of the cost of labour, and at the rate of 120% on the cost of labour in excess of $1,000.00"

2. Ontario Retail Sales Tax

All prices tendered for the work shall include Ontario Retail Sales Tax.

The Ontario Sales Tax ruling states:

"that the 8% Ontario Sales Tax is applicable to all materials used to construct, repair or that is attached to real property but the 8% Ontario Sales Tax is not applicable to the labour content of a contract"

Non-Resident Contractors

If the Contractor is non-resident in Ontario, he shall, immediately, after being notified by the Region that the Agreement has been executed by the Region, obtain from the Retail Sales Branch a certificate showing that the Contractor has registered with the Retail Sales Tax Branch and shall submit such certificate to the Region at the same time that he furnishes the Performance Bond.

The Engineer may withhold the issuance of the order to commence work to a non-resident Contractor if the required certificate has not been furnished.

If the Contractor is non-resident in Ontario, he shall not commence work or order any materials or equipment for the Contract until he has submitted to the Region the required certificate.

Contract Completion

A final Payment Certificate for any balance of holdback monies due, less any liens (plus 25% of any such liens) which the Region has notice and less any amounts that the Region deems necessary to retain for its protection against claims liabilities, damages or costs for any other claims the Region may have against the Contractor under this Contract or other Contracts or otherwise, and such payment shall not in any way be construed as an acceptance of all or any part of the work of material required under this Contract.

The Final Payment Certificate will become due and payable sixty (60) days after date of acceptance of the entire work.

The Contract shall be deemed to be completed and services or materials shall be deemed to be last supplied to the improvement when the price of completion, correction of a known defect or last supply is not more than the lessor of,

a) 1% of the Contract Price; and

b) $1,000.00

The Final Payment Certificate will be released only after satisfactory evidence has been given to the Region that Section 32 of the Construction Lien Act, 1983, has been compled with.

5. INSURANCE

RHW Form 200, delete clauses 200.03.02, 200.03.03, 200.03.04, 200.03.05 and insert the following revised clauses dated 86/12/31.

.03.02 Comprehensive General Liablilty Insurance

.01 Without restricting the generality of 200.03.09 Contractor's Resposibility for Losses and Damages, "Comprehensive General Liability Insurance" will be provided and maintained by the Contractor, subject to the limits of not less than two million dollars inclusive per occurrence for bodily injury, death and injury, death and damage to property including loss of use thereof.

.02 The insurance shall be in the joint names of The Region, and the Contractor, and shall also cover as Unnamed Insureds all Subcontractors and anyone employed directly or indirectly by the Contractor or his Subcontractors to perform a part or parts or the Work but excluding suppliers whose only function is to supply and/or transport products to the project site.

.03 The insurance shall also include as Unnamed Insureds the architectural and engineering consultants of the Region.

.04 The insurance shall preclude subrogation claims by the Insurer against anyone insured thereunder.

Comprehensive General Liabiltiy Insurance shall include coverage for:

.05
1. Premises and operations liablilty.
2. Products or completed operations liability.
3. Blanket contractual liability.
4. Cross liability.
5. Elevator and hoist liability.
6. Contingent employer's liablility.
7. Personal injury liability arising out of false arrest, detention or imprisonment or malicious prosecution; libel, slander or defamation of character; invasion of privacy, wrongful eviction or wrongful entry.
8. Shoring, blasting, excavating, underpinning, demolition, pile driving and caisson work, work below ground surface, tunnelling and grading, as applicable.

.03.03 Automobile Liability Insurance

The Contractor shall provide and maintain liability insurance in respect of owned licensed vehicles subject to limits of not less than one million dollars inclusive.

.03.04 Aircraft and/or Watercraft Liability Insurance

The Contractor shall provide and maintain liability insurance with respect to owned or non-owned aircraft and watercraft, as may be applicable, subject to limits of not less than one million dollars, inclusive.

Such insurance shall be in the joint names of the Contractor, the Region, the Architect and those parties defined in .03.02. (.02 & .03) where they have an interest in the use and operation of such aircraft or watercraft. The insurance shall preclude subrogation claims by the Insurer against anyone insured thereunder.

General Conditions

All liability insurance will be maintained continuously until twelve (12) months after the date the Engineer issues a Certificate of Acceptance of all the Work.

All liability insurance policies shall contain an endorsement to provide all Name Insureds with prior notice to changes and cancellations. Such endorsement shall be in the following form:

"It is understood and agreed that the coverage provided by this policy will not be changed or amended in any way or cancelled until 30 days after written notice of such damage or cancellation shall have been given to all Named Insureds".

The Contractor shall provide the Region with evidence of all liability insurance prior to commencement of the work.

.03.05 Property Insurance

.01 The Contractor must provide and maintain property insurance, insuring the full value of the Work in the amount of the Contract Price and full value as stated or products that are specified to be provided by the Owner for incorporation into the Work. The insurance shall be in the joint names of the Contractor and the Region, and shall include the interests of the Region, the Contrtactor and all others having an insurable interest in the Work. The policies sahll include all Sub-Contractors as Unnamed Insureds or, if they specifically request as Names Insureds. The policies shall preclude subrogation claims by the Insurer against anyone insured thereunder. The coverage is Comprehensive Builders Risk I.A.O. Form No. 507, with a deductible provision which shall be the responsibility to the Contractor, Subcontractor and all others having an isured interest in the work.

.03.05 Property Insurance....Cont'd

.02 The policies shall insure against all risks of direct loss or damage subject to the exclusion and limitations specified in the Supplementary General Conditions and the actual policy form. Such coverage shall apply to but limited to:

(i) All products, labour and supplies of any nature whatsoever, the property of the Insureds or of others for which the Insureds may have assumed responsibility, to be used in or pertaining to the site preparations, demolition of existing structures, erection and/or fabrication and/or reconstruction and/or repair of the insured project, while on the site or in transit, subject to the exclusion of the property specified.

(ii) The installation, testing and any subsequent use of machinery and equipment including boilers, pressure vessels or vessels under vacuum.

(iii) Damage to the Work caused by an accident to and/or the explosion of any boiler(s) or pressure vessel(s) forming part of the work.

Such coverage shall exclude construction machinery, equipment, temporary structural and other temporary facilities, tools and supplies used in the construction of the work and which are not expendable under the contract.

.03 The Contractor shall provide the Region with evidence of all insurance prior to commencement of the work.

Policies provided shall contain an endorsement to provide all Named Insureds with prior notice of changes and cancellations. Such endorsement shall be in the following form:

"It is understood and agreed that the coverage provided by this policy will not be changed or amended in any way nor cancelled until 30 days after written notice of such change or cancellation shall have been gine to all Named Insureds".

.03.05 Property Insurance....Cont'd

.03 All such insurances will be maintained continuously until thirty (30) days after the date the Engineer issues a certificate of acceptance of all the Work. All such insurance will provide for the Region to take occupancy of the Work or any part thereof during the term of this insurance. Any increase in the cost of this insurance arising out of such occupancy shall be at the Contractor's expense.

.04 The policies shall provide that, in the event of a loss, payment for damage to the Work shall be made to the Region and the Contractor as their respective interests may appear. The Engineer shall act on behalf of the Region and the Contractor for the purpose of adjusting the amount of such loss with the Insurers. On the dertermination of the extent of the loss, the Contractor shall immediately proceed to restore the work and shall be entitled to receive from the Region (in addition to any sum due under the contract) the amount at which the Region's interest in the restoration work has been appraised, such amount to be paid as the Work of the restoration proceeds and in accordance with the Engineer's certificates for payment. Damage shall not affect the rights and obligations of either party under the Contract except that the Contractor shall be entitled to such reasonable extension of time for substantial and total performance of the work as the Engineer may decide.

.05 The Contractor shall provide insurance coverage on tools, machinery and equipment to the satisfaction of the Engineer.

(a) Fire insurance, extended coverage, or special insurance on construction equipment and tools owned by or rented to or in the care, custody and control of the Trade Contractor, other than equipment owned or rented by or for the Region.

(b) Contractor's Equipment Insurance to cover all constructon equipment owned or rented or for which the Contractor may be responsible against all risks of loss or damage with coverage to allow for the immediate replacement on the Work of such lost or damaged equipment. All settlements of claims for any loss or damage shall be made without the right of subrogation against the Region, the Construction Manager, any of their employees, servants and agents.

6. RHW Form 100, page 4
change clause .04 to read:

.04 PERFORMANCE OF CONTRACT SURETY

The Bidder is advised that when a contract, the value of which is more than $500, is awarded by the Region a Performance of Contract Bond in an amount equal to 50 percent of the Contract Price and a Labour and Materials Bond equivalent to 50% of the value of the Contract Price to be supplied by the bidder in form approved by the Regional Solicitor, is required to be deposited with the Regional Treasurer by the successful Bidder at the time of execution to the contract.

Department of Engineering
88 01 16

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SECTION 01010 - SUMMARY OF WORK

1.0 SUMMARY OF WORK

1.01 DESCRIPTION OF PROJECT

The Construction of a Landfill Gas Control System to be implemented by the Regional Municipality of Hamilton-Wentworth is a remedial program designed to collect landfill gas generated by the refuse at the former Upper Ottawa Street Landfill, route the gas via a pipeline to a central location, adjacent to the Landfill and safely burn the collected gases.

1.02 LOCATION

The Site is located at the former Upper Ottawa Street Landfill Site in Hamilton, Ontario. The landfill is generally located within an area bounded to the south by Stone Church Road, to the north by Red Hill Creek, to the west by Upper Ottawa Street and to the east by the C.N. Rail Line.

1.03 ACCESS TO SITE

Access to the Site is available via a gravel service road from Upper Ottawa Street.

The Contractor shall make all necessary arrangements with the authority having jurisdiction for the movement of his material and equipment to and from the Site over public roadways.

1.04 DESCRIPTION OF WORKS

The Works to be performed under this Contract include but are not limited to the following items:

1. mobilization of construction facilities, materials, equipment plant and personnel necessary to perform the Works,
2. site preparation,
3. demolition of existing concrete foundation and slab,
4. excavation, trenching and backfilling for the pipeline construction and civil works,
5. construction of vertical gas extraction wells,
6. supply and installation of HDPE gas header, and subheader system,
7. supply and installation of chain link fence and gates, repair and restoration of the existing chain link fence,

8. miscellaneous site works to construct the gas plant compound,
9. supply and installation of drain piping,
10. supply and installation of precast structures for condensate drain chambers c/w all ladders, C.I. frames and covers, pipeline wall seals, pipe and fittings as required,
11. supply and installation of concrete foundations, floor slabs and housekeeping pads,
12. supply and installation of all steel framings for moisture separator shelter, pipe supports stands, etc.,
13. paint all hollow metal doors and frames, miscellaneous steel framing, above grade steel pipe and fittings,
14. supply and installation of a prefabricated steel building c/w all insulation, interior panelling, blowout panels, hollow metal doors and frames, door hardware, and window and frame c/w all miscellaneous sill and roof flashings, eavestrough and downspouts,
15. supply and installation of a burner system c/w control panel, electric valve, flame arrestor, etc.,
16. supply and installation of mechanical systems c/w blowers, steel piping, valves, fittings, roof and wall dampers, room exhaust fans, etc.,
17. supply and installation of electrical systems c/w room lighting, heating, wiring all motors and starters, gas detection system, warning systems, main electrical service and distribution system, step down transformers, etc.

1.05 CONSTRUCTION SCHEDULE

The Works shall be performed in accordance with the following Construction Schedule:

1. Works shall be commenced on or before May 1, 1989;
2. Works shall be completed on or before November 1, 1989.

1.06 DRAWINGS

Drawings issued with and forming part of the Contract Documents and Specifications are listed below. Such drawings are issued for tender purposes only.

SECTION 01010 - SUMMARY OF WORK

Perform the Works in accordance with drawings signed "Approved for Construction" by the Engineer. Such drawings will be issued to the Contractor during progress of the Works and will consist of tender drawings revised as required by the Engineer and additional drawings if required by the Engineer.

Revised "Approved for Construction" drawings may be issued from time to time by the Engineer and such drawings shall supersede previous revisions.

If revised "Approved for Construction" drawings are issued which necessitate changes to the Contractor's shop drawings not yet reviewed, no separate payment will be made for the Contractor's expenses involved in revising such shop drawings.

Drawing No.	Sheet No.	Date of Dwg. or Latest Rev.	Title
89-M-1	1	November, 1988	Existing Conditions
89-M-1	2	January, 1989	General Site Plan
89-M-1	3	November, 1988	Header Pipe Chainage STA 0+000 to STA 0+295
89-M-1	4	November, 1988	Header Pipe Chainage STA 0+295 to STA 0+513
89-M-1	5	November, 1988	Profiles Along Subheaders
89-M-1	6	November, 1988	Vertical Well and Subheader Details
89-M-1	7	December, 1988	Condensate Trap Chamber Details
89-M-1	8	January, 1989	Gas Plant Compound, Layout and Details
89-M-1	9	November, 1988	Building Layout and Elevations
89-M-1	10	January, 1989	Foundation and Structural Details
89-M-1	11	January, 1989	Blower Room Mechanical

Drawing No.	Sheet No.	Date of Dwg. or Latest Rev.	Title
89-M-1	12	November, 1988	Mechanical - Flare and Piping
89-M-1	13	November, 1988	Miscellaneous Details
89-M-1	14	December, 1988	Electrical Site Service and Building Layout
89-M-1	15	December, 1988	Electrical Schematics and Details

SECTION 01020 - GENERAL REQUIREMENTS

1.0 GENERAL REQUIREMENTS

1.01 MEASUREMENT METHODS

The Engineer will be responsible for measurement of all items for payment. The Contractor shall provide at his own expense a qualified assistant(s) to the Engineer to expedite the taking of these measurements and to facilitate agreement on pay item quantities.

Measurement clauses in the Project Specifications define methods the Engineer will use to determine quantity of completed work for payment purposes.

Notify the Engineer sufficiently in advance of operations to permit required measurements for payment and provide reasonable and necessary opportunities and facilities for making such measurements.

1.02 DELIVERY

No material or equipment of any kind shall be delivered to the Site until approval in writing has been applied for and obtained by the Contractor from the Engineer that such material or equipment may be delivered.

Delivery of material and equipment to the Site shall be coordinated with work sequence, scheduled to limit the requirement for storage at the Site to the practical minimum and shall be limited to areas approved by the Engineer.

1.03 EXISTING UTILITIES

In general, the locations of some existing major utilities, whether aboveground or underground, are indicated on the Drawings. This information has been obtained from utility maps and from verbal descriptions provided by the various agencies involved. The Engineer or the Owner do not guarantee the accuracy or completeness of this information and it is to be understood that other aboveground or underground utilities not shown on the Drawings may be encountered during the course of the Works. In any case, minor lines such as telephone, cable television, water, gas, and sewer services may not be indicated.

Existing aboveground utilities including but not limited to power transmission and distribution, if shown on the Drawings or if easily identified, shall, at the Contractor's expense, be maintained, relocated, rerouted, removed and restored as may be necessary by the Contractor in a manner satisfactory to owners and operators of the utilities and to the Owner.

Existing major underground utilities and appurtenant structures whether shown on the Drawings or not shall, at the Contractor's expense, be maintained and restored by the Contractor.

Minor underground utility service lines adjacent to the Site, including but not limited to sanitary sewer services, gas services, water services, house or yard drains, and electric, cable television, or telephone services, shall be maintained, relocated, rerouted, removed and restored by the Contractor with the least possible interference with such services and in no case shall the interference of such service lines be considered for extra compensation under any of the special cases listed above.

The right is reserved by owners of public utilities and franchise to enter upon any street, road, right-of-way, or easement for the purpose of maintaining their property and for making necessary repairs or changes caused by the Works. The costs thus incurred shall be paid by the Contractor.

1.04 QUALITY CONTROL

A. Inspection

The Engineer shall have access to the Works. If parts of the Works are in preparation at locations other than at the Site, provide access to such work whenever it is in preparation or progress.

Give timely notice requesting inspection if work is designated for special tests, inspections or approvals or by instructions of the Engineer, or other authorities having jurisdiction.

If the Contractor covers or permits to be covered any part of the Works that has been designated for special tests, inspections or approvals before such is made, uncover such work, have the inspections or tests satisfactorily completed and make good such work at no additional cost to the Owner.

The Engineer may order any part of the Works to be examined if such work is suspected to be not in accordance with the Contract Documents and Specifications. If, upon examination such work is found not in accordance with the Contract Documents and Specifications, correct such work and pay the cost of examination and correction. If such work is found in accordance with the Contract Documents, the Owner will pay the cost of examination and replacement.

B. Independent Testing Agencies

Independent testing agencies may be engaged by the Owner for the purpose of inspecting and/or testing portions of the Works.

Employment of testing agencies does not preclude or relax the responsibility of the Contractor to perform as specified.

If defects or deficiencies are revealed during inspection and/or testing, correct defects and deficiencies as directed by the Engineer at no cost to the Owner.

Pay all costs for retesting and reinspection.

C. Access to Work

Allow inspection/testing agencies access to the Works whenever it is in preparation or progress and provide reasonable facilities for such access.

D. Procedures

Notify the appropriate agency and the Engineer in advance of the requirement for tests, inspections or approvals, in order that attendance arrangements can be made.

Submit samples and/or materials required for testing, as specifically requested in the Specifications in an orderly sequence so as not to cause delay in the performance of the Works.

Provide labor and facilities to obtain and handle samples and materials on the Site.

E. Rejected Work

Remove defective work, whether the result of poor workmanship, use of defective products or damage and whether incorporated in the Works or not, which has been rejected by the Engineer as failing to conform to the specified requirements.

Make good all other work damaged by such removals or replacements promptly.

If in the opinion of the Engineer it is not expedient to correct defective work or work not performed in accordance with the Contract Documents and Specifications, the Owner may deduct from

the Contract Price the difference in value between the work performed and that called for in the Contract Documents and Specifications, the amount of which shall be determined by the Engineer.

1.05 RESTORATION

A. General

Supply all labor, materials and equipment necessary or required to restore the Site as specified and shown on the Drawings.

Restoration shall mean replacement, repairs or reconstruction to a condition at least as good as or better than the condition prior to commencement of the Works.

Without limiting the generality of the foregoing or other requirements of the Contract, preserve and protect any existing feature encountered at the Site during the performance of the Works including but not limited to buildings, structures, curbs and gutters, fences, pavement, manholes and catchbasins, utilities, roads, streets, walks, grassed areas and other graded or improved areas.

Restore the Site and utilitize construction methods and procedures during the performance of the Works which keeps disturbance and damage of whatever nature to existing conditions to the practical minimum.

Certain existing features including fences, roadways and grassed areas may be required to be removed.

This Specification describes minimum requirements and not necessarily all the requirements for restoration work. Except where specifically required by other Sections of the Specifications, reinstate areas of the Work and areas affected by the performance of the Work to conditions that existed prior to commencement of the Work and to match condition of adjacent, undisturbed areas.

Examine the Site to become fully informed regarding the extent of existing conditions at the Site.

Prior to commencement of work at the Site, inspect the Site with the Engineer to review and establish the condition of all surface features on or adjacent to the Works. This inventory shall be mutually agreed between the Engineer and the Contractor and shall not thereafter be subject to dispute. Such inventory as may be amended, from time to time, will be used by the Engineer to check compliance by the Contractor with the requirements of this Specification.

Provide ongoing review, inspection and attendance during performance of the Works to properly document conditions. Inform the Engineer of any existing condition at the Site affected by the Works which may require restoration. Do not cover up any of the Works without approval from the Engineer.

Unless specified otherwise, ensure that quality, grades, elevations and extent of materials including subgrades, finish grades, thickness of pavements for roadways and parking areas are properly documented during their removal to ensure reconstruction to their original condition.

B. Material

1. General

Restoration material shall be new, except as otherwise specified, not damaged or defective and of the best quality for the purpose intended. If requested by the Engineer or specified in other Sections of the Specifications, furnish evidence as to type, source and quality of materials or products provided.

Should any dispute arise as to the quality or fitness of materials, whether obtained on-site or off-site, whether previously inspected by the Engineer prior to use or not, the decision to use any material or product in the finished Works shall rest strictly with the Engineer.

Handle and store products or materials in a manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

Packaged or bundled products shall be stored in original and undamaged condition with manufacturers' seals and labels intact.

Products subject to damage from weather shall be stored in weatherproof enclosures.

Cementitious products shall be stored clear of the ground and kept dry.

Sand when used for grout or mortar materials, shall be kept clean and dry.

2. Granular Material

Granular base shall comply with Section 02200.

3. Landscaping

Landscaping will be limited to restoration of all work areas to existing conditions unless otherwise noted in Division 2.

4. Concrete

Concrete mixes shall be approved by the Engineer and shall be obtained from approved ready-mix suppliers.

Mixes shall be capable of producing concrete for the purpose intended and consistent with the standard of material being replaced.

5. Other Materials

Other material required for restoration work shall be provided by the Contractor subject to the approval of the Engineer.

C. Execution

1. Preparation

Prior to commencement of restoration work, inform the Engineer of proposed material, methods and procedures to repair, replace or reconstruct any damaged or suspected damage to the Works.

Notify the Engineer sufficiently in advance of any required attendance to assess and/or document existing conditions.

Ensure that backfilling is properly completed before commencement of restoration work. Do not proceed with restoration work without the approval of the Engineer.

Obtain approval from the Engineer prior to covering surfaces with concrete.

2. Performance

a. General

Perform cutting, remedial and coordination work required to make the parts of the Works fit together.

Do not alter original conditions without approval from the Engineer.

Dismantle and/or salvage materials for reuse where practicable except as otherwise specified. Exercise due care when removing material for salvage. Materials damaged through improper handling or through loss after removal shall be repaired or replaced by the Contractor.

Store and protect removed material approved for reuse in approved locations.

Grade gravelled areas to original grade, properly sloped to ensure drainage, reasonably smooth and free of depressions that will pond or collect water.

b. Fences

Dismantle fences when required for performance of the Works subject to the following conditions:

1. obtain approval from the Engineer prior to removal.
2. provide approved alternate security measures until fencing is restored.
3. dismantle fencing carefully and in a manner to ensure reuse of components consistent with original condition.
4. reconstruct fence to original condition, alignment and height and properly connect to undisturbed fencing.

Existing fence material removed, broken, damaged or lost shall be replaced with same kind of material, same finish and in not less than the same dimensions as the original fencing.

Fence posts originally set in concrete shall not be reused and shall be replaced and set in new concrete where applicable.

Fence material not approved for reuse shall become the property of the Contractor and shall be removed from the Site.

1.06 LAYOUT

The Engineer will establish the basic horizontal and vertical control lines and levels for the Works. Preserve all survey reference points as set or established by the Engineer. Any errors entering into the Works through failure to notify the Engineer concerning lack of preservation of such survey reference points shall be made good at the Contractor's expense.

Lay out the Works from the aforementioned basic control lines and levels and assume all responsibility for the correctness of such laying out. Supply, establish and maintain all additional survey reference points and other work lines and levels necessary for the performance of the Works.

Preserve permanent reference points during construction and make no changes or relocations without approval of the Engineer. All official monuments or benchmarks shall be carefully preserved or replaced. In the event any such monument or marker is disturbed as a result of the

Contractor's operations, replace or reset such monument or marker in a manner satisfactory to the Engineer. Replaced or reset monuments shall be of acceptable type and quality and shall be located so as to clear existing utilities or any other interferences. They shall be placed in a manner consistent with good and recognized engineering and surveying practice by a qualified registered surveyor.

The Engineer may, at any time, check the Contractor's survey and layout work but this shall not relieve the Contractor of any of his responsibilities to carry out the Works in accordance with the Contract.

1.07 SUPERVISION

Ensure that a fully qualified construction superintendent is in full time attendance to coordinate the work of the civil, mechanical, electrical trades and the burner system.

Ensure that the commissioning and trial operation test (Section 13560) is properly coordinated with the necessary subcontractors and support staff.

1.0 SUBMITTALS

1.01 SHOP DRAWINGS

If specified, detailed fabrication and erection drawings of material to be supplied shall be prepared from typical details shown on "Approved for Construction" drawings and shall be submitted for review by the Engineer before fabrication commences.

Review submittals prior to submission to the Engineer which review shall represent that necessary requirements have been determined and verified or will be, and that each submittal has been checked and co-ordinated with the requirements of the Works and the Contract Documents. Such submittals shall bear the Contractor's approval stamp prior to their initial submission to the Engineer and shall be signed, dated and identified as to the specific project.

Dimensions shown on the Contractor's fabrication and erection drawings shall conform with actual measurements of completed associated structures and affected adjacent work.

Shop drawings shall indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of the Works. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of the Project Specification Section under which the adjacent items will be supplied and installed. Shop drawings shall be cross-referenced to appropriate Project Specifications and Drawings.

Submit four copies of shop drawings for each requirement requested in the Project Specifications and as the Engineer may reasonably request.

One print of each drawing will be returned stamped "Reviewed" by the Engineer, or marked up to show the Engineer's required modifications. Correct and resubmit shop drawings as often as necessary until the Engineer returns drawings without marked modifications stamped "Reviewed".

The Contractor shall not be relieved of any part of his responsibilities for correctness of his drawings bearing the Engineer's "Reviewed" stamp.

Adjustments made on shop drawings are not intended to change the Contract Price. If adjustments affect the value of the Works, state such in writing, as specified elsewhere in the Contract, to the Engineer prior to proceeding with the work.

Make changes in shop drawings as the Engineer may require, consistent with the Contract Documents and Specifications. When resubmitting shop drawings notify the Engineer in writing of any revisions other than those requested.

1.02 PRODUCT DATA

If specified, submit to the Engineer four copies of product data sheets or brochures for requirements requested in the Project Specifications and as the Engineer may reasonably request where shop drawings will not be prepared due to standardized manufacture of product.

1.03 OPERATING MAINTENANCE MANUALS

If specified, submit to the Engineer four copies of operating and maintenance manuals.

Manuals shall contain operational information on equipment, cleaning and lubrication schedules, filters, overhaul and adjustment schedules and similar maintenance information. Instructions in this manual shall be in simple language so as to guide the Owner in the proper operation and maintenance of components.

The contents shall be bound in a three-ring hard covered binder approved by the Engineer.

In addition to information specified, the binder shall include the following:

1. Title Sheet, labelled "Operating and Maintenance Instructions", containing project name and date.
2. List of names, addresses and phone numbers of subcontractors and suppliers who can effect repair or maintenance on equipment.
3. List of Contents.
4. Final shop drawings and product data of equipment.
5. Record drawings of mechanical and electrical installation.
6. Full description of system(s) and operation.
7. Other requirements as may be described in further detail in the Project Specifications.

1.04 CONSTRUCTION SCHEDULE

Within ten days of execution of Contract Documents and prior to mobilization of material and equipment, submit, in writing, a detailed construction schedule to the Engineer for review and approval. The schedule shall show clearly, in weekly stages, the proposed progress of the Works and shall show completion of each portion of the Works within the time period specified herein. The schedule shall indicate

the size of the work force to be on the Site during each stage of the Works. As a minimum the schedule shall include each item identified in the Form of Tender as a work activity and identify the proposed start date and completion date for that activity. Anticipated man hours by trade and equipment hours for each type of equipment must be identified on a weekly basis for each activity.

1.05 RECORD DRAWINGS

After award of Contract, the Engineer will provide a set of drawings for the purpose of maintaining record drawings.

Accurately and neatly record deviations from the Contract Documents caused by site conditions and changes ordered by the Engineer.

Locations of concealed components of mechanical and electrical services shall be recorded.

Such drawings shall be identified as "Record Drawings" and shall be maintained in new condition and made available for inspection on the Site by the Engineer.

On completion of the Works and prior to final inspection, submit record documents to the Engineer.

SECTION 01100 - HEALTH AND SAFETY

1.0 HEALTH AND SAFETY

The Contractor's agents, workmen, employees or any persons under his control, including subcontractors, shall abide by the applicable provisions of the Occupational Health and Safety Act and, in addition, shall be made fully aware of the combustible and explosive nature and of the suffocation hazard of the landfill gases, including methane, carbon dioxide and mercaptans, some of which are poisonous.

Necessary precautions shall be taken to ensure the avoidance of hazardous conditions on Site. No open flame, matches, smoking, welding or other activity potentially capable or generating an explosion shall be allowed in any area associated with landfill gases. Field welding, if required shall only be permitted under well ventilated conditions and only with the written approval of the Engineer. Particular care shall be taken in relatively confined areas such as trenches and over the gas wells.

Precautionary measures in the form of signs or symbols informing personnel of the danger from combustible gases shall be provided and maintained. Signs such as:

.1 Danger - Keep Away - Explosive Gases

.2 Danger - No Open Flame or Matches

.3 Danger - No Smoking

shall be posted along each temporary work area;

An approved temporary gas tight cap shall be provided at all cessations of pipe laying until further horizontal lengths of pipe are ready to be fitted. The temporary cap shall be removed for installation of further pipe only under well ventilated conditions.

Gas concentrations shall be monitored in all trenches and other enclosure for this project, temporary forced draft ventilation facilities shall be provided if, in the opinion of the Engineer, ventilation is required to deal with the detected combustible gas or other odourous gases, for the safety of the workmen.

The presence of hazardous landfill gases in combustible concentrations is probable during the construction of the landfill gas header, subheaders and vertical wells. During construction, air quality shall be monitored and warning systems in the form of audible alarms and signs shall be provided to ensure the safety of all workmen. During construction operations in all hazardous areas and confined spaces, the Contractor shall provide the following additional safety measures in accordance with Policy No. 002 B of the Region:

SECTION 01100 - HEALTH AND SAFETY

1) The employees must be trained and competent in the use of a gas detector capable of measuring combustible gas, toxic gas and oxygen deficiency.

2) The employees must be trained in the use of and able to use effectively, a respirator with the appropriate air purifying elements, (cartridges) attached, and the supplied air respirators as required for confined space entry.

3) The employees must adhere to the Regional Municipality of Hamilton-Wentworth Accident Prevention Policy No. 002, "Confined Space Entry Procedures" or equivalent, when required to enter confined spaces.

4) The employees will be supplied with rubber boots and disposable coveralls, 5 Min. escape S.C.B.A., respirator with two chemical cartridges for organic vapors, chlorine, hydrogen chloride, sulfur dioxide, dusts, fumes, mists, asbestos and radionuclides, a pair of (nitrile) rubber gloves and a gas detector capable of measuring combustible gas, toxic gas and oxygen deficiency.

5) The employees will dress as outlined above and have the respirator readily available before entering the landfill site (5 min. escape S.C.B.A. required for confined space entry only).

6) The respirator will be fitted to the face to ensure proper seal before removing the cap from the gas sampling vent and kept on until the vent is resealed. (Regional Safety Policy 002 A applies to ensure proper seal.)

7) Gloves will be used to remove and replace the cap from the gas sampling vent.

8) The employees are counselled to wear respirators at any other time they feel necessary while carrying out this duty.

The landfill cover is comprised of miscellaneous steel wastes. The Contractor shall ensure that all workmen under his control, as a minimum, require coveralls, safety glasses and gloves in addition to the standard apparel required by the Ministry of Labour during all excavation backfilling and drilling operations in the landfill.

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1.0 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1.01 ACCESS ROADS

A. EXISTING ACCESS ROADS

The Contractor will be permitted reasonable use of existing access road from Upper Ottawa Street to the Site and of existing access roads at the Site subject to the following conditions:

1. traffic on access road through existing City of Hamilton Works yard shall not be interrupted or interfered with at any time;
2. abide by regulations issued by the Owner with regard to traffic circulation on the Site; and
3. maintain existing access roads. Maintenance shall consist of making good any wear and tear and damage arising out of construction operations as well as maintenance measures specified for additional access roads in Clause 1.01.B of this Section.

B. ADDITIONAL ACCESS ROADS

Construct and maintain such additional access roads as may be required to perform the Works.

Location of additional access roads shall be subject to the Engineer's approval.

The Owner and Other Contractors shall be allowed reasonable use of any roads which the Contractor may construct.

Construction of additional access roads shall include such improvement of existing roads as the Contractor may require to perform the Works.

1.02 SERVICES SUPPLIED BY OWNER

A. GENERAL

The Owner will provide for the Contractor, free of charge during performance of the Works, power subject to conditions specified in the following subclauses. The Owner will not be responsible for consequences of any unintentional interruptions to continuity of such services.

Provide and remove on completion of the Works, connections, distribution system, and any other equipment which are installed to use services supplied by the Owner.

Give the Engineer at least 24 hours notice of intention to connect to any of the Owner-supplied services described herein.

B. POWER

Electrical power will be available at 600 volt, 3 phase, 60 Hz, subject to the following conditions:

1. Owner will supply power to the existing electrical service which is mounted on a hydro pole located in the southeast corner of the Site. All service connections at this location or at the proposed location of the gas plant provided by the Contractor.
2. Power shall not be used for temporary heating purposes.

1.03 WORKING AREAS

Designated areas will be available at the Site for the Contractor's office and for storage as required during performance of the Works. No other areas on the Site shall be used by the Contractor without the Engineer's written consent.

Additional areas required on the Site by the Contractor for any purpose shall be developed by the Contractor at his own expense subject to the Engineer's approval.

Do not unreasonably encumber the Site with materials or equipment. Stored products or equipment which interfere with operations of the Owner, Engineer or other Contractors shall be moved as directed by the Engineer.

1.04 DEWATERING

Dewater the various parts of the Works including, without limitation, excavations, structures, foundations and work areas.

Employ construction methods, plant, procedures and precautions that ensure the Works including excavations are stable, free from disturbance and dry.

Construction methods may include but are not limited to: sheeting and shoring; groundwater control systems; surface or free water control systems employing ditches, diversions, drains, pipes and/or pumps; and

any other measures necessary to enable the whole of the Works to be carried out in the dry.

Provide sufficient and appropriate labor, plant and equipment necessary to keep the Works free of water including standby equipment necessary to ensure continuous operation of dewatering system.

Take precautions necessary to prevent uplift of any structure or pipeline and shall protect all excavations from flooding and damage due to surface runoff.

Control surface drainage to ensure that runoff from unstabilized areas is intercepted and diverted to a suitable outlet.

Dispose of water in a manner not injurious to public health or safety, to property or to any part of the Works completed or under construction.

1.05 DUST CONTROL

Provide dust control measures to prevent unsafe condition for the movement of construction equipment and to protect adjacent land from dust.

Measures required to control dust resulting from the Works shall be included in the rates entered in Schedule of Prices and no separate payment will be made under any item of Schedule of Prices for dust control.

1.06 SANITARY FACILITIES

Provide sufficient sanitary facilities for workers in accordance with governing regulations and ordinances.

Post notices and take such precautions as required by local health authorities.

Maintain area and premises in a clean and sanitary condition.

1.07 FIRST AID FACILITIES

Keep at the Site at all times a fully equipped first aid kit. During working hours, at least one of the Contractor's employees shall have a valid St. John's Ambulance Certificate.

1.08 PARKING

On-Site parking for the Contractor's staff will be permitted. However, no parking is allowed in the adjacent City of Hamilton Works Yard. All temporary parking areas shall be restored to preconstruction grades and conditions.

1.09 TEMPORARY HEATING

Provide temporary heating, covering and enclosures as necessary, to protect all work and material against damage by dampness and cold and to facilitate completion of the Works. Supply all attendance, fuel, equipment and material required for temporary heating.

Open flames shall not be permitted.

1.10 GUARDRAILS AND BARRICADES

Guardrails, barricades shall be erected around all excavations, open trenches and active work areas adjacent to high traffic areas, as determined by the Engineer. Provide, erect and remove all guardrails, barricades and flagging required as a result of the Works.

1.11 TELEPHONE

Provide a separate telephone service at each of the Contractor's and Engineer's office. A radio telephone is not acceptable. The Contractor will not be responsible for long distance calls made by the Engineer.

1.12 OFFICES

During performance of the Works, provide and maintain suitable offices at the Site for the Contractor and the Engineer.

The Engineer's office shall have a minimum floor area of 2.4 metres x 6.0 metres complete with a desk and chair. Provide the office with lighting, heating in winter and air conditioning in summer.

1.13 SITE LIGHTING

Provide, operate and maintain adequate Site lighting to facilitate performance of the Works and to maintain a safe working condition.

DIVISION 2 - SITEWORK

SECTION 02001 - GAS EXTRACTION WELLS

1.0 GAS EXTRACTION WELLS

1.01 GENERAL

A. DESCRIPTION

1. Work Included

Work of this Section consists of the construction of gas extraction wells as specified and as shown on the Drawings. The work includes but is not necessarily limited to the following:

1. drilling boreholes,
2. supply and installation of 100 mm diameter PVC pipe,
3. supply and installation of 10 mm stone,
4. supply and installation of bentonite seal.
5. supply and installation of temporary airtight caps on each vertical gas well.

2. Work Not Included

The following tasks associated with the work of this Section do not form part of this Specification:

1. locating and marking each well location prior to the commencement of drilling operations.

B. QUALITY ASSURANCE

1. General

Procure all permits, certificates, and licenses required for the execution of the Works. Any waivers from the authorities having jurisdiction shall be requested and obtained by the Contractor from the authorities and submitted to the Engineer prior to the commencement of work at the Site. Comply with all Federal, Provincial and local laws, ordinances or rules and regulations relating to the performance of the Works.

2. Installer Qualifications

The drilling contractor must have a minimum of five years experience with drilling on landfill sites. The drilling crew must contain at least one member with a minimum of five years experience in this area.

C. SUBMITTALS

1. General

Submit to the Engineer, a resume detailing the experience of the drilling subcontractor and personnel with regards to the installation of boreholes in refuse and the related hazards associated with the landfill gas. Submit the name of the manufacturer and the model number of the drilling equipment to be utilized for review by the Engineer.

D. JOB CONDITIONS

1. Site Stratigraphy

The Site is underlain by refuse material consisting primarily of a heterogeneous mix of municipal and industrial waste.

2. Protection

Protect the existing landfill cover, completed wells and wells under construction from damage resulting from the work of this Section.

3. Sequencing and Scheduling

Be responsible for sequencing and scheduling the work subject to the following conditions:

a) the Engineer will determine location and sequence of drilling events;

b) drilling equipment shall complete each well in its entirety before moving to a subsequent well;

c) the Engineer will determine the successful completion of a well; and

d) the Engineer will determine if and when refusal in a borehole has occurred and it should be abandoned.

In the event of loss of tools or equipment during any phase of constructing a well, the Contractor is not entitled to any additional payment for time spent or expense incurred in an attempt to fish out or recover the tools or equipment prior to possible abandonment of a well.

1.02 PRODUCTS

A. GENERAL

Materials shall be provided from sources approved by the Engineer.

B. MATERIALS

1. Gas Extraction Piping

   Pipe shall be Schedule 80 PVC complying with CSA B137.3. PVC pipe shall be perforated as shown on the Drawings. Fittings shall be same standard as pipe. Joints shall be solvent welded.

2. Bentonite Seal

   Bentonite seal shall consist of 12 mm diameter pressed bentonite pellets or raw bentonite whichever is more applicable and as approved by the Engineer.

3. Stone

   Stone shall be 10 mm clear stone.

4. Water

   Water when used in drilling and well construction including, cleaning, or other activities shall be potable water.

5. Other Materials

   Other materials shall be selected by the Contractor for the purpose intended and shall be subject to the Engineer's approval prior to use.

1.03 EXECUTION

A. PREPARATION

Do not commence drilling operations until the Engineer has located and marked each well location.

B. PERFORMANCE

1. Drilling

Use drilling equipment and methods approved by the Engineer.

Provide a drilling rig at least equivalent to a Central Mining Equipment Model CME75. Equivalent shall be defined as a drill rig possessing equal or greater weight and power.

Drilling shall be performed in locations and to depths shown on the Drawings or as directed by the Engineer. All boreholes to be converted into gas extraction wells shall be drilled utilizing 150 mm inside diameter continuous flight hollow stem augers to ensure a minimum 280 mm diameter borehole is advanced to the elevation shown on the Drawings or as directed by the Engineer.

Holes for extraction wells shall be drilled round, true to line and plumb.

Upon encountering non-penetratable refuse material, the boring shall be terminated as directed by the Engineer.

Each well shall be completed in the following manner. A 100 mm diameter perforated PVC pipe shall be installed to the depth shown on the Drawings. Ten mm clear stone shall be placed in the annular space of the borehole to a height of approximately 450 mm above the perforated depth. A 600 mm thick bentonite seal shall be placed above the stone.

Prevent foreign matter from entering boreholes and take all necessary and proper precautions to prevent contamination of the well by introduction of any foreign substances.

In the event that the Contractor should fail to complete a well, or should he abandon a well because of loss of tools or equipment, or for any other cause except as a result of refusal caused by non-penetratable refuse material, the Contractor, if requested and as directed by the Engineer, shall fill the abandoned hole with the drill cuttings, provide a bentonite seal on the borehole and salvage and remove such equipment as can be salvaged. Except as specified otherwise, the cost of abandonment of an incomplete well, including the filling, drilling or other work performed on the abandoned well shall be at the Contractor's expense.

2. Perforated PVC Collection Pipe

The perforated PVC collection pipe shall be capped at the bottom as shown on the Drawings. Provide a temporary airtight cap on the top of the vertical well until the final connection to the subheader pipeline is completed.

Joints shall be solvent welded by methods approved by the Engineer and in accordance with the manufacturer's recommendations. Pipe shall be installed plumb and in the centre of the borehole.

3. Stone

Stone shall be free of any deleterious substance prior to installation and shall be placed in a manner that does not damage or disturb pipe.

4. Bentonite Sealing

Seal the annulus around the extraction pipe with approved bentonite to seal the annulus to the depth shown on the Drawings.

1.04 MEASUREMENT AND PAYMENT

A. GAS EXTRACTION WELL

1. Measurement

a) Measurement for each vertical gas extraction well will be made in vertical metres for the actual depth of borehole completed as measured in place by the Engineer from existing ground surface to the approved bottom of the borehole.

b) Measurement for vertical boreholes which have been abandoned as a result of drilling refusal will be made in vertical metres of the actual depth of borehole completed as measured in place by the Engineer from existing ground surface to the approved bottom of the borehole.

2. Payment

a) Payment for the quantity determined above for the vertical gas wells will be made at the unit price per vertical metre stipulated in the Form of Tender for Item 1 which price and payment shall be full compensation for all labour, materials and equipment required for augering 280 mm diameter boreholes; supply and placement of stone; supply and placement of all piping and end caps; supply and placement of bentonite seal; mobilization between wells; and all other miscellaneous items for which separate payment is not provided under other Items.

b) Payment for the quantity determined above for the abandoned vertical boreholes will be made at the unit price per vertical metre stipulated in the Schedule of Provisional Quantities and Prices for Item 1 which price and payment shall be full compensation for all labour, materials and equipment required for augering the boreholes.

SECTION 02050 - DEMOLITION

1.0 DEMOLITION

1.01 GENERAL

A. DESCRIPTION

1. Work Included

Work of this Section consists of the supply of all labor, materials, plant and equipment required or necessary for the demolition of an existing reinforced concrete foundation as specified and as shown on the Drawings. The work shall include but is not necessarily limited to the following:

a) demolish and remove 450 mm deep strip foundation footing;

b) demolish and remove 150 mm thick slab on grade; and

c) fill void spaces resulting from demolition with granular materials in accordance with Section 02200.

1.02 PRODUCTS

Supply all materials and equipment necessary or required for demolition work.

1.03 EXECUTION

A. PERFORMANCE

Prior to commencing demolition activities, notify and obtain the approval of the Engineer.

Demolish structures in locations and to the demolition limits as shown on the Drawings or as directed by the Engineer.

Carefully break concrete within the demolition limits by mechanical means using air tools, hydraulic tools, drilling and wedging, or any other means approved by the Engineer. Blasting will not be permitted.

Break demolition debris into sizes suitable for transportation and disposal.

Load demolition debris directly into transport vehicles/containers or temporarily stage demolition debris pending disposal at a location on site as designated by the Engineer.

1.04 MEASUREMENT AND PAYMENT

Payment for demolition shall be included at the lump sum price stipulated in the Form of Tender for Item 2 which price shall include the full price for demolition and all other miscellaneous items for which separate payment is not provided under other items.

SECTION 02200 - EARTHWORKS

1.0 EARTHWORKS

1.01 GENERAL

A. DESCRIPTION

1. Work Included

Work of this Section consists of excavation, trenching, backfilling and grading as specified and as shown on the Drawings.

Excavation and trenching shall mean the removal of all materials of whatever nature encountered in the Works whether wet, frozen or otherwise and shall include boulders, weathered rock, partially cemented materials, concrete, pavements and rock which can be removed by ripping or heavy duty mechanical excavation equipment without drilling and blasting.

The work includes the following:

a) Trenching as required for installation of gas header, subheaders, drain lines and water supply lines.

b) Excavation as required for connections to vertical gas wells.

c) Excavation for precast concrete structures.

d) Excavation for building and flare foundations.

e) Backfilling completed installations to the sub-grade for restoration work.

f) Sorting, handling, temporary stockpiling and hauling of material removed from excavations and trenches and approved by the Engineer for use as backfill.

g) Loading, transporting and disposing of excess or unsuitable materials removed from excavations and trenches at specified disposal locations as directed by the Engineer.

h) Supply, placement, grading and compaction of granular material as specified for the construction of gas plant compound and restoration of all disturbed areas of existing access roads.

2. Related Work Specified in Other Sections

The following items of work related to the work of this Section are specified in other Sections as noted:

1. supply and installation of bedding for gas header piping and condensate drain. - Section 02700

2. backfill with granular material void spaces resulting from demolition. - Section 02050

3. Terminology

For the purpose of this Section, the following terminology shall apply:

Bedding means the material used to support a pipe, and extends up to the horizontal line 300 mm above the top of the pipe.

Cover material means the backfill material placed from the top of the bedding to the subgrade for restoration work.

B. REFERENCES

The publications listed below form part of this Specification to the extent specified in this Section:

1. American Society for Testing and Materials (ASTM):

C117	Standard Test Method for Materials Finer than No. 200 (0.075 mm) Sieve in Mineral Aggregates By Washing.
C136	Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
D422	Standard Method for Particle-Size Analysis of Soils.
D698	Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5-lb (2.49-kg) Rammer and 12-in. (305-mm) Drop.
D1140	Standard Test Method for Amount of Material in Soils Finer than No. 200 (0.075 mm) Sieve.
D1556	Standard Test Method for Density of Soil In Place by the Sand-Cone Method.
D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Ballon Method.

D2487	Standard Classification of Soils for Engineering Purposes.
D2922	Standard Test Methods for Density for Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth).
D3017	Standard Test Method for Moisture Content of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth).
E11	Standard Specification for Wire-Cloth Sieves for Testing Purposes.

C. QUALITY ASSURANCE

1. General

The rules of The Occupational Health And Safety Act with respect to excavation and construction shall at all times be strictly observed.

The work of this Section shall comply with Section 01100 Health and Safety, the same as if written out herein in full.

Material excavated from the Works will be judged suitable or unsuitable for backfilling by the Engineer in accordance with specified requirements for excavated material to be used as backfill in the Works.

2. Source Quality Control

Inform the Engineer of source of materials to be incorporated into the Works and provide access to the source and processed material for the purposes of sampling and testing prior to delivery to the Site.

If in the opinion of the Engineer, materials from the proposed source do not meet, or cannot reasonably be processed to meet specified requirements, obtain an alternate source or demonstrate that material from the source in question can be processed to meet specified requirements.

Should a change of material source be proposed during the Works, advise the Engineer sufficiently in advance of proposed change to allow sampling and testing.

Acceptance of a material at source or failing conduct of sampling and testing at source by the Engineer does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.

The Contractor shall bear the cost of sampling and testing of materials which fail to meet specified requirements.

D. SUBMITTALS

1. General

Comply with Section 01030 Submittals.

2. Source

Submit to the Engineer the location of the proposed source of bedding, granular material for roadways and cover material at least 14 days prior to commencing production including any change in material source during performance of the Works.

3. Geotechnical Data

Submit to the Engineer grain size distribution curves for each classification of material prior to commencing production.

E. PRODUCT DELIVERY AND HANDLING

1. Delivery

Handle and transport materials at all times in a manner and with equipment that will avoid segregation and contamination by any deleterious material.

2. Storage and Handling

When necessary, as approved by the Engineer, stockpile material on the Site in approved locations designated by the Engineer.

Ensure that stockpile sites are level, well drained, free of foreign materials, and of adequate bearing capacity to support the weight of the materials to be placed thereon. Stockpiles shall be either far enough apart or separated by substantial dividers to prevent intermingling.

Except where material is stockpiled on acceptably stabilized areas, provide a suitable base to prevent contamination of the piled material or may place material on the ground, provided that the bottom of the pile is not incorporated into the Works and in any case, materials supporting stockpiles shall not be used in the Works.

Provide and maintain access to stockpile areas, shall stockpile materials in a manner to prevent segregation and upon completion of the Works shall load and haul excess material to a designated disposal location on-Site or spoil adjacent to the excavation when authorized by the Engineer.

Equipment and methods of handling material shall be such as to prevent contamination by foreign material, intermixing, segregation and breakage.

F. JOB CONDITIONS

1. Existing Conditions

a. Existing Buried Utilities and Structures

Size, depth and location of existing utilities and structures as shown on the Drawings are approximate and are for guidance only. Completeness and accuracy are not guaranteed.

Prior to commencing any excavation work, notify the Engineer and applicable owner or authorities, and establish location and state of use of buried utilities and structures. Clearly mark such locations to prevent disturbance during the performance of the Works.

Confirm locations of buried utilities and structures by careful test excavations.

Maintain and protect from damage, water, steam, sewer, gas, electric, telephone and other utilities and structures encountered. Obtain direction from the Engineer before moving or otherwise disturbing utilities or structures.

b. Existing Buildings and Surface Features

Conduct, with the Engineer, a preconstruction condition survey as described in Section 01020.

Repair damage resulting from the Works as described in Section 01020.

Where guardrail or fencing is required to be removed, obtain approval from the Engineer prior to removal and remove by dismantling carefully and store and protect the components until required for reinstallation by the Contractor.

2. Environmental Requirements

Dewater excavations in accordance with Section 01500.

Water from the excavations shall be considered as leachate and shall be discharged into the existing leachate system.

Protect open excavations against flooding and damage due to surface runoff.

Suspend operations whenever climatic conditions, as determined by the Engineer, are unsatisfactory for placing fill to the requirements of this Section.

After occurrence of heavy rains, do not operate equipment on previously placed material or on approved excavations until the material has dried sufficiently to prevent occurrence of excessive rutting.

Fill shall not be placed in a frozen state or against frozen excavations or previously placed material. Fill shall not be placed on snow, ice, water or other objectionable material or on improperly prepared excavations or previously placed material.

Where excavations or previously placed material have been softened or eroded, remove soft and yielding material or otherwise objectionable or damaged areas and replace with compacted fill as specified at no additional cost to the Owner.

3. Protection

Maintain and protect from damage all utilities and structures encountered. In the event of disturbance of or damage to any utility or structure immediately notify the Engineer.

Protect existing buildings and surface features which may be affected while work is in progress.

Protect existing buildings and structures where temporary unbalanced earth pressures are liable to develop on walls or other structures utilizing bracing, shoring or other approved methods to counteract unbalance.

Protect structures and pipelines from any uplift or disturbance during placement and compaction of backfill material.

Employ procedures for extracting sheeting, placing backfill and discontinuing groundwater control such that they ensure the backfill load is applied gradually and disturbance of utilities, structures and their foundations is avoided.

Protect and ensure the stability of excavations and protect open excavations against flooding and damage due to surface runoff or water from any source.

In the event of damage, replace or repair as directed by the Engineer.

4. Sequencing and Scheduling

Utilize approved native materials from the Works before obtaining material from off-Site sources.

Interruptions of utility services to existing buildings or facilities which become necessary either directly or indirectly due to work required under this Contract shall be coordinated through the Engineer. Should the down time for connections be limited as to duration and time (week end, nights, or holidays) perform the work during the period designated at no additional cost to the Region.

1.02 PRODUCTS

A. NATIVE FILL

Native fill for backfilling purposes shall be selected material from excavations and trenches or other sources, approved by the Engineer. Approved material shall mean material that is free of the following unsuitable materials as determined by the Engineer.

1. material containing loam, roots, vegetable matter, cinders, sod or refuse,
2. frozen material or material containing snow or ice,
3. rocks and lumps of material with dimensions greater than specified layer thickness before compaction,
4. other deleterious or foreign matter detrimental to the use intended.

B. GRANULAR "A" MATERIAL

Granular material used for structural fill and gravel surface areas shall be Granular "A" conforming to OPSS 1001.

1.03 EXECUTION

A. Preparation

Advise the Engineer in advance of excavation operations.

Remove fencing, guardrail and other surface features or obstructions, ice and snow, from surfaces to be excavated within required limits.

Strip topsoil from within limits of excavation and stockpile suitable material as directed by the Engineer, for respreading after backfilling.

B. INSPECTION

Do not allow or cause any of the work performed or installed to be covered up or enclosed by work of this Section prior to required inspections, tests or approvals.

Obtain approval from the Engineer for material to be placed in the Works and for excavations and previously placed material.

Obtain approval from the Engineer prior to placing fill against structures.

C. PERFORMANCE

1. Excavation and Trenching

a. General

Excavate to lines, grades, elevations and dimensions shown on the Drawings or as directed by the Engineer.

Remove other obstructions encountered during excavation.

b. Trenching

Unless otherwise specified or indicated, any method of excavation which will not damage or endanger adjacent structures or property or disturb the natural or fill soils below and adjacent to the excavation may be used.

In no case during performance of the Works shall excavation advance more than 60 metres ahead of the active installation.

Hand trim, make firm and remove loose material and debris from trenches. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

Do not obstruct flow of surface drainage or natural watercourses.

Excavate to leave earth bottoms of excavations undisturbed, level, free from loose, soft or organic matter.

Notify the Engineer when soil at bottom of the excavation appears unsuitable and proceed as directed by the Engineer.

Remove unsuitable material from trench bottom to extent and depth directed by the Engineer.

Except as permitted by the Engineer, the trench at the end of the day shall not be excavated in advance of pipe laying and shall be fully backfilled, except where the trench is fully shielded. At the end of the day, secure any shielded area of trench which is left open by surrounding it with snow fencing.

Trenches shall be of the necessary width for proper laying of pipe. The banks of pipe trenches shall be as nearly vertical as practicable. Care shall be taken not to overexcavate. The bottom of trenches shall be accurately excavated and graded to provide uniform bearing and support for each section of the pipe on full thickness of approved bedding material at every point along its entire length except for the portions of the pipe sections where it is necessary to excavate for bell holes and for the proper jointing of pipe. Bell holes and depressions for joints shall be dug after the trench bottom has been graded with, and, in order that the pipe rest on the prepared bottom for as nearly its full length as practicable, bell holes and depressions shall be only of such length, depth, and width as required for properly making the particular type of joint. Stones shall be removed as necessary to avoid point bearing. Except as hereinafter specified for wet or otherwise unstable material, overdepths shall be backfilled as and with materials specified for backfilling the lower portion of trenches. Whenever wet or otherwise unstable material

that is incapable of properly supporting the pipe is encountered in the bottom of the trench, such material shall be overexcavated to a depth to allow for construction of a stable pipe bedding.

c. Overexcavation

Where, in the opinion of the Engineer, the undisturbed condition of the soils is inadequate for the support of the header pipe, overexcavate to adequate supporting soils as directed by the Engineer and refill the excavated space with approved material to the proper elevation in accordance with the procedure specified for backfill. Where so directed by the Engineer and except as otherwise specified, the excavation and removal of inadequate material as specified, furnishings and placement of such material in excess of the quantities shown on the Drawings will be paid for under the appropriate item of the Additional Unit prices or as Extra Work. All such overexcavated material may be used in the the Works or shall be spoiled on the Site as approved by the Engineer and shall be placed and compacted as specified.

Should unauthorized excavation be carried below the lines and grades indicated on the Drawings because of the Contractor's operations including errors, methods of construction or to suit his convenience, refill such excavated space to the proper elevation as directed. Should the natural or fill foundation soils be disturbed or loosened because of the Contractor's operations, they shall be recompacted or removed and the space refilled as directed by the Engineer at no additional cost to the Owner.

Where required, due to unauthorized over-excavation, correct at no additional cost to the Owner as follows:

1. fill under concrete structures with concrete as specified in Section 03000.

2. fill under other areas with specified granular bedding compacted to at least 95% maximum dry density as determined in accordance with ASTM D698.

d. Excavated Material

Excavated material approved by the Engineer for use as backfill in the Works shall be selected, loaded, hauled to required location and, if necessary, temporarily stockpiled until required in locations approved by the Engineer.

Excavated material not approved by the Engineer for use as fill in the Works including boulders, debris, brush, roots or other perishable matter will be classified unsuitable for fill by the Engineer and shall be disposed of in specified spoil areas.

Dispose of waste material and surplus and unsuitable excavated material to designated areas on-Site as directed by the Engineer.

2. Temporary Stockpiles

Locations of temporary stockpiles shall be approved by the Engineer prior to placing material in such stockpiles.

Temporary stockpile slopes shall be maintained not steeper than 1.5 horizontal to 1 vertical.

Stockpiles shall not block natural drainage of surrounding area and area surrounding stockpiles shall be maintained in neat and tidy condition.

Leave temporary stockpile areas in a properly drained and graded condition following removal of temporarily stockpiled material so that natural drainage of surrounding area will not be restricted and the area will be free of depressions that will pond or collect water.

Excess stockpiled material shall be disposed of on site in an area designated by the Engineer.

3. Backfilling

a. General

Do not proceed with backfilling operations until the Engineer has inspected and approved the installations.

Areas to be backfilled shall be free from debris, snow, ice, water or frozen ground.

Do not use backfill material which is frozen or contains ice, snow or debris.

Backfill around installations as follows:

1. bedding and surround material for gas piping and water piping shall be placed as specified in Section 02700,

2. except as provided for elsewhere, backfill around or over cast-in-place concrete shall not be placed within 72 hours of concrete placing,

3. layers shall be placed simultaneously, on both sides of installed work to equalize loading,

4. material shall be placed by hand under, around and over installations until two feet of cover is provided; backfill shall not be dumped directly on installations.

Place backfill material continuously and in uniform layers not exceeding 150 mm compacted thickness unless specified otherwise, up to grades shown on the Drawings.

Compact each layer before placing succeeding layer as specified.

Use fill of types specified and shown on the Drawings.

Where excavated material is insufficient in quantity to complete backfilling, backfill with an approved clean material in accordance with the requirements specified for native fill. Use select native fill material approved for backfilling before using imported backfill.

4. Compaction

Compact each layer of backfill placed as specified to achieve the following densities:

a) Under Roadways and Similar Use Pavements Including Adjacent Shoulder Areas. At least 95% of maximum dry density determined in accordance with ASTM D698 up to the elevations at which the requirements for pavement subgrade materials apply.

b) Under Concrete Slabs on Grade. At least 98% of maximum dry density in accordance with ASTM D698 up to the underside of the concrete slab.

c) Under Lawn-Seeded Areas. At least 90% of maximum dry density determined in accordance with ASTM D698 up to the elevations at which the requirements for landscaping apply; thickness of each layer shall not exceed 600 mm.

d) Under Other Areas. At least 95% of maximum dry density determined in accordance with ASTM D698; thickness of each layer shall not exceed 300 mm.

Apply water as is necessary during compaction to obtain specified density. If fill is excessively moist, aerate with suitable equipment and methods until moisture content is corrected. In areas not accessible to rolling equipment, backfill shall be compacted to specified density with mechanical tampers approved by the Engineer.

The type, size and efficiency of compaction equipment shall be approved by the Engineer and shall be capable of achieving the specified degree of compaction. When operating equipment adjacent to structures, exercise care so as not to cause damage or displacement.

D. FIELD QUALITY CONTROL

1. Quality Control by Engineer

A testing firm hired and approved by the Engineer will perform tests in the field and in the laboratory on samples of compacted fill to determine if materials meet the specified requirements and except as otherwise specified, tests will be at the expense of the Owner. Copies of test reports will be supplied to the Contractor on request.

2. Frequency of Testing by Engineer

At least one density test and one moisture content determination for each lift placed will be made.

At least one particle size analysis will be made for any change in material being used in the backfill.

The method used and the frequency of such tests will be determined by the Engineer. When the Contractor disputes the results of any test, further tests will be taken but the decision to use any test method other than the one chosen shall be made only by the Engineer.

3. Methods of Testing by Engineer

Maximum density of fill will be determined in accordance with ASTM D698.

Bulk density will be determined in the field in accordance with ASTM D1556 or with ASTM D2167 or with ASTM D2922, whichever is most suitable to obtain representative density of soil tested.

Particle size analysis will be performed in accordance with ASTM D422 or ASTM D1140, whichever is appropriate to material tested.

Moisture content of backfill in place will be determined in accordance with ASTM D3017.

4. Failure to Meet Specified Requirements

When tests indicate that the required degree of compaction is not achieved or cannot be obtained with the equipment in use or the procedure being followed, modify his operations so that the equipment and procedures will produce the required results.

The generality of the foregoing does not preclude employing other measures to achieve specified results including but not necessarily limited to additional passes of compaction equipment, additional ballast, removing and replacing material, reduction in lift thickness or wetting or drying material.

E. ADJUSTMENT AND CLEANING

Finish surfaces to established grade but not uniformly high or low. Surface irregularities shall be corrected by loosening and adding or removing material until surface is within specified grade.

Clean and reinstate work areas and areas affected by equipment outside areas specified to be excavated, to specified restoration condition.

Upon completion of backfilling, remove all excess material and debris from work areas, roads, ditches and leave ditches in a properly graded condition sloped as required to permit proper drainage and free of depressions that will pond or collect water or debris that will restrict flow.

1.04 MEASUREMENT AND PAYMENT

No separate payment will be made for earthworks.

SECTION 02443 - CHAIN LINK FENCES AND GATES

1.0 CHAIN LINK FENCES AND GATES

1.01 GENERAL

A. DESCRIPTION

1. Work Included

Work of this Section consists of supply and installation of chain link fences and gates as specified and as shown on the Drawings. The work includes but is not necessarily limited to the following:

a) Supply and installation of chain link fence and gate for plant compound;

b) Supply and installation of new gate in existing chain link fence; and

c) Repair existing chain link fence adjoining new plant compound.

3. Technical Requirements Specified in Other Sections

Following items of work shall be carried out in accordance with the technical requirements of the Section noted below:

1. concrete for fence post footings - Section 03000.

B. REFERENCES

Publications listed below form part of this Specification to the extent specified in this Section:

1. American Society for Testing and Materials (ASTM):

A120	Standard Specification for Pipe, Steel, Black and Hot-Dipped Sinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses.
A121	Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
A392	Standard Specification for Zinc Coated Steel Chain-Link Fence Fabric.

C. SUBMITTALS

1. General

Comply with Section 01030 - Submittals

2. Product Data

Submit manufacturer's product data.

3. Certification

If requested by the Engineer, submit manufacturer's certification that specified materials were produced and tested in accordance with this Section.

D. PRODUCT DELIVERY AND HANDLING

1. Delivery

Deliver chain-link fence fabric in firmly tied tight rolls.

Tag each roll clearly indicating class of coating, specified wire size, mesh size, height of fabric, ASTM A392 designation and manufacturer's name.

2. Storage and Handling

Store and handle materials in accordance with manufacturer's instructions. In the event of damage, make repairs or replacements approved by the Engineer.

Repair damaged zinc-coated surfaces in accordance with Section 09900.

E. JOB CONDITIONS

1. Existing Conditions

The security of the Site shall be maintained during the repairs to the existing fencing and installation of the new gate.

2. Protection

Protect zinc-coated surfaces from damage.

Protect fencing materials from distortion or bending.

1.02 PRODUCTS

A. GENERAL

Replacement of existing fencing will extend from the new gate to the nearest undamaged/undisturbed post.

B. MATERIALS

1. Concrete

Concrete shall comply with Section 03000.

2. Chain Link Fence Fabric

Chain link fabric shall comply with ASTM A392 in heights shown on the Drawings and with a uniform 50 mm mesh pattern formed with 3.8 mm zinc-coated steel wire.

3. Posts and Rails

Posts and rails shall be galvanized steel pipe, standard weight complying with ASTM A120 and the following:

1. end and corner posts shall be 89 mm outside diameter and 1220 mm longer than height of fabric, and
2. line posts shall be 60 mm outside diameter and 1070 mm longer than height of fabric,
3. top rail shall be 43 mm outside diameter, and
4. bracing shall be 43 mm outside diameter.

4. Tension

Tension wires shall be single strand, galvanized steel wire, 5 mm diameter.

5. Fasteners

Fasteners shall be single strand, galvanized steel wire conforming to requirements of fence fabric, 5 mm diameter.

6. Tension Bars

Tension bars shall be 5 x 20 mm minimum galvanized steel.

7. Gates

Gate frames and bracing shall comply with ASTM A120, galvanized steel pipe, standard weight. Frames shall be 89 mm outside diameter and 1200 mm longer than height of fabric and shall be adequately braced.

Gates shall be fabricated to shapes shown on the Drawings with electrically welded joints and hot dip galvanized after welding.

Fence fabric shall be fastened to gate on outside with twisted selvage at top. Fabric and other components used on gates shall match those of fence and shall be same quality.

Gates shall be furnished with galvanized malleable iron hinges, latch and latch catch with provision for padlock which can be attached and operated from either side of installed gate. Gate shall be capable of opening 180 degrees in direction shown on Drawings.

Double gates shall be furnished with chain hook to hold gates open and centre rest with drop bolt for closed position, where shown on Drawings.

8. Fittings and Hardware

Fittings and hardware shall be galvanized malleable iron.

Post caps shall provide waterproof fit and shall fasten securely over posts and to carry top rail. Turnbuckles shall be drop forged.

9. Barbed Wires

Barbed wire shall consist of 2 strands of 2.5 mm diameter, galvanized steel wires twisted with 4 points, 2.05 mm round barbs spaced not more than 125 mm apart, complying with ASTM A121.

10. Extension Arms

Extension arms shall be galvanized malleable iron with eyes to hold top rails and an outward projection to hold barbed wire overhang. Provide projection with equally spaced slots to hold 3 strands of barbed wire spaced 150 mm apart with the topmost barbed wire 300 mm above the fabric. Extension arms shall project from fence at 45 degrees above horizontal.

11. Zinc Coating

Zinc coating shall comply with the following:

1. chain link fence fabric in accordance with ASTM A392, Class 2 except that wire zinc-coated prior to weaving into fabric shall be electrolytically zinc-plated;

2. posts, rails, frames and braces in accordance with ASTM A120;

3. barbed wire in accordance with ASTM A121, Class 1; and

4. other fittings and hardware in accordance with ASTM A153.

12. Touch-Up Paint

Touch-up paint shall comply with Section 09900.

13. Grounding Rods

Grounding rods shall be 16 mm diameter copperweld rod, 3 m long.

1.03 EXECUTION

A. PREPARATION

Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts.

Provide maximum 52 mm clearance between bottom of fence fabric and ground surface, except on soft ground fabric shall extend below grade to compensate for shifting sand or soil.

Do not commence installation until grading work is complete.

B. INSPECTION

Provide Engineer with 24 hours' notice of intention to commence fencing.

C. INSTALLATION

1. Posts

Install posts along lines shown on the Drawings or as directed by the Engineer.

Excavate post holes to dimensions shown on the Drawings in the line of the fence.

Space line posts equidistant at intervals not exceeding 3050 mm measured parallel to ground surface grade.

Space straining posts at equal intervals not exceeding 150 m if distance is greater than 150 m between end or corner posts on straight continuous lengths of fence over reasonably smooth grade.

Install additional straining posts as directed by the Engineer and at sharp changes in grade.

Install corner post where change in alignment exceeds 20 degrees.

Install end posts at end of fence and at buildings.

Install gate posts on both sides of gate openings.

2. Concrete

Place concrete in accordance with Section 03000 in post holes and embed posts into concrete to depths shown on the Drawings. Extend concrete above ground level and slope to drain away from posts. Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.

Do not install fence fabric until concrete has cured a minimum of 5 days.

Determine position of centre gate rest for double gate.

Cast gate rest in concrete as directed. Dome concrete above ground level to shed water.

3. Braces

Install brace between end and gate posts and nearest line post, placed in centre of panel and parallel to ground surface. Install braces on both sides of corner and straining posts in similar manner.

4. Top Rail

Install top rail between posts and fasten securely to posts with waterproof caps.

5. Tension Wire

Install bottom tension wire, stretch tightly and fasten securely to end, corner, gate and straining posts with turnbuckles and tension bar bands.

6. Fabric

Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 356 mm intervals. Install knuckled selvage on bottom.

Secure fabric to top rails and bottom tension wire with tie wires at 600 mm intervals and to line posts at 300 mm intervals in a vertical taut position. Give tie wires minimum two twists.

Join rolls of fabric by weaving a single picket into the ends of the rolls to form a continuous mesh.

7. Barbed Wire

Stretch barbed wire tightly through slots in extension arms and tie securely at ends.

8. Gates

Install gates in locations shown on Drawings true to opening and plumb in a closed position.

Hang gates with specified fastenings with clearances above finished grade as shown on the Drawings.

9. Extension Arms

Turn barbed wire extension arms outward away from the fenced area. Use vertical extension on gates and at end, corner and gate posts.

10. Caps

Provide caps on the top of gate posts, gate frame extensions supporting barbed wire, and on any other posts which are not fitted with barbed wire extension arms.

D. ADJUSTMENT AND CLEANING

Touch-up damaged galvanized surfaces in accordance with Section 09900.

1.04 MEASUREMENT AND PAYMENT

1. Measurement

Measurement for the supply and installation of chain link fence and gates including repaired sections of existing fencing will be made at the actual number of lineal metres of fence installed as measured in place by the Engineer along the fence line continuously through posts and gates.

2. Payment

Payment for the quantity determined above will be made at the unit price per metre stipulated in the Form of Tender for Item 3 which price and payment shall be full compensation for supplying all labour, plant, materials and equipment required to remove and restore the damaged sections of existing chain link fence adjacent to the proposed gas plant compound; supply and installation of two new gates complete with all hardware; supply and installation of new chain link fence complete with fence posts, bracing, hardware; and all other miscellaneous items for which separate payment is not provided under other Items.

SECTION 02700 - PIPED UTILITIES

1.0 PIPED UTILITIES

1.01 GENERAL

A. DESCRIPTION

1. Work Included

Work of this Section consists of supply, installation and testing of piped utilities as specified and as shown on the Drawings. The work includes but is not necessarily limited to the following:

a) supply and installation of HDPE gas header and subheader systems including pipe, related fittings and appurtenances, and shut-off valves;

b) supply and installation of PVC condensate drain lines and polyethylene water supply line;

c) precast concrete condensate trap chambers complete with mechanical piping, fittings and appurtenances; and

c) supply and installation of bedding;

d) flushing and cleaning pipelines; and

e) all other measures required to complete the buried piping.

2. Related Work Specified In Other Sections

The following items of work related to the work of this Section are specified in other Sections as noted:

1. Mechanical - Section 15

3. Technical Requirements Specified In Other Sections

1. Earthworks - Section 2200

4. Terminology

Piping shall mean pipe, fittings and appurtenances.

Fittings shall include elbows, tees, couplings, flanges reducers, caps, adaptors.

HDPE shall mean high density polyethylene.

B. REFERENCES

The publications listed below form part of this Specification to the extent specified in this Section:

1. Canadian Standards Association (CSA):

B 181.12	Recommended practice for the Installation PVC Drain Waste and Vent Pipe and Pipe Fittings.

2. American Society for Testing and Materials (ASTM):

A48	Standard Specification for Gray Iron Castings.
C117	Standard Test Method for Materials Finer than No. 200 (0.075 mm) Sieve in Mineral Aggregates by Washing.
C136	Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
C478	Standard Specification for Precast Reinforced Concrete
D1248	Polyethylene Plastic Molding and Extraction Compound.
D3034	Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
E11	Standard Specification for Wire-Cloth Sieves for Testing Purposes.
D698	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 5.5 lb. (2.49 kg) Remmer and 12 in. (305 mm) Drop.

C. QUALITY ASSURANCE

Do not bury any sections of buried pipeline without the approval of the Engineer. Obtain all necessary inspections of the drain piping as required by the local municipality.

D. SUBMITTALS

1. General

The Contractor shall comply with Section 01300 - Submittals

2. Certificates

Submit manufacturer's certification of all materials to be furnished prior to their delivery to the Site, certifying conformance to this Specification.

E. PRODUCT DELIVERY AND HANDLING

Deliver, store and handle piping and valves in accordance with applicable requirements of the specified references, the manufacturer's instructions and as specified herein.

Store pipe in the staging area until strung along the pipeline alignment.

Use every precaution to prevent damage to the pipe. No metal tools or heavy objects shall be unnecessarily permitted to come in contact with the pipe. Any damage to the pipe from any cause during installation and before final acceptance by the Engineer shall be repaired by the Contractor as directed by the Engineer, at no additional cost to the Owner. Material that, in the opinion of the Engineer, cannot be satisfactorily repaired, shall be removed and replaced at no additional cost to the Owner.

F. JOB CONDITIONS

1. Protection

Protect pipe, valves, fittings and appurtenances from damage.

Ensure that the cessation of all pipelines are properly sealed with an airtight plug.

1.02 PRODUCTS

A. PIPE AND FITTINGS

1. HDPE

Gas piping shall be Series 60 polyethylene pipe and buried water supply line shall be Series 160 polyethylene pipe, both identified as Type III high density, Class C, Category 5, Grade P3408 in accordance with ASTM D1248.

Joints for HDPE pipe shall be thermal butt fusion welded.

2. PVC

Buried PVC pipe shall comply with ASTM D3034, SDR35, locked-in gasket and integral bell system.

Pipe and fittings for condensate trap assemblies shall be Schedule 80 PVC, and shall comply with ASTM D 1785.

B. PIPE BEDDING

Pipe bedding shall be Granular A conforming to the following grading requirements:

ASTM Sieve Size	Percent Passing
22.4 mm	100
16.0 mm	75-100
13.2 mm	65-90
4.75 mm	35-55
1.18 mm	15-45
.300 mm	5-22
.075 mm	0-8

C. CONDENSATE TRAP CHAMBER

1. Precast Concrete

Chambers shall consist of precast reinforced concrete sections complying with ASTM C478. Precast concrete bases shall be placed on minimum 200 mm Class C concrete bedding extending 300 mm beyond the outside diameter of the base. Cement shall be Type 10 as specified in Clause 1.02.B.9 of Section 03000. Concrete strength shall be 27.6 Mpa. Openings in the precast chambers shall be precast or cored in the field to provide a smooth surface to ensure a watertight fit for the Link Seal gasketing.

2. Joints

Joints between precast sections shall be watertight and shall consist of manufacturer's '0' ring gaskets.

3. Ladder Rungs

Ladder rungs shall be 20 mm diameter deformed rail steel bars as specified in Clause 1.02.B.4 of Section 03000 and shall be hot dipped galvanized after fabrication in accordance with CSA G164, with safety pattern, drop step type and shall be cast integral with the precast concrete units.

4. Adjusting Rings

Adjusting rings shall be Moduloc adjustment units. Adjustment units shall be placed no more than 3 rows high and no less than 2 rows high.

5. Frames and Covers

Frames and covers shall be cast iron material conforming to ASTM A48 Class 30. Cover shall be perforated and shall be provided with two 25 mm square lifting holes. Covers shall bear evenly on frames.

E. VALVES

1. Butterfly valves

The size of the valves shall be as shown on the Drawings.

All butterfly valves shall be from one manufacturer, Keystone or equal quality where approved by the Engineer, with the manufacturer's name and valve size clearly marked on the outside.

The valves for the control of the gas extraction wells shall be 100 mm dia. butterfly valves with a stainless steel disc and shaft assembly. The valve body shall be isolated from the media by an Buna N seat or equivalent material. No part of the body or shaft shall be exposed to the flowing media.

The valves selected will be Keystone Model F1020 DEE3 or an approved equivalent.

2. Plug Valve

Valve shall be DeZurik Series 100 Eccentric Plug valve or Keystone Figure 2132 Bullcentric plug vavle for the condensate trap chamber. Supply the valve complete with cast iron body, top and the bottom grease fittings, stainless steel bolting, interior and exterior epoxy coating and a Ni-Resist plug with Bune N resilient plug facing.

3. Valve Boxes

Valve boxes will be a two section, ductile iron, adjustable, telescoping type complete with valve operating extension rod and lid. The internal extension spindle shall extend to within 150 mm of the finished ground surface and shall include a top operating nut and rock disc.

The valve box shall be Mueller Model A-759 or an approved equivalent.

4. Sampling Port

Sampling port will consist of a 25 mm Schedule 80 PVC pipe terminated 150 mm below the valve box cover and sealed with a 25 mm threaded PVC cap. Sampling port will be housed in a polyethylene valve box as noted above.

F. PIPELINE WALL SEALS

The pipe to wall penetration closures into the condensate trap chambers shall be Link-Seal as manufactured by Thunderline Corporation. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the pipe and wall opening.

The required inside diameter of each individual wall opening or sleeve shall be determined before ordering or fabricating the seal. The inside diameter of each wall opening shall be sized as recommended by the manufacturer to fit the pipe and Link-Seal to assure a water-tight joint. Sizing (correct Link-Seal model and number of links per seal) may be obtained through manufacturer's catalog. If pipe O.D. is non-standard due to coating, insulation, etc., consult Thunderline's factory for engineering assistance and recommendation before proceeding with wall opening detail.

1.03 EXECUTION

A. PREPARATION

Clean pipes, fittings, valves and appurtenances of accumulated debris and water before installation.

Carefully inspect materials for defects including the coatings and remove defective materials from the Site.

Supply, erect and maintain approved batter boards and sight rails to ensure accurate line and grade of all pipes. At least 3 batter boards shall be in use at all times, placed not more than 15 m apart. The Contractor may use other methods of setting line and grade such as laser, providing the method is approved by the Engineer prior to use.

No deviation from the line and grade set out by the Engineer will be tolerated, except where changes in direction of the laying of pipes along a curve are limited to the pipe manufacturer's tolerances for joints.

Piping shall be laid to the lines and grades shown on the Drawings.

B. INSPECTION

Obtain approval from the Engineer for completed excavation prior to placing bedding material or piping.

Obtain approval from the Engineer prior to backfilling and compaction of all sections of buried pipelines.

C. INSTALLATION

1. Excavation, Trenching and Backfilling

Excavate, trench and backfill in accordance with Section 02200.

2. Granular Bedding

Granular bedding shall be placed to details shown on the Drawings. Shape bed true to line and grade to provide . continuous uniform bearing surface for pipe exterior. Blocks shall not be used when bedding pipe.

Shape transverse depressions in bedding as required to make joints.

Compact the full width of bed to at least 95% of maximum density as determined in accordance with ASTM D698.

In areas of overexcavation, fill the excavation below level of bottom of specified bedding with additional compacted granular material bedding.

4. Pipe

Pipe shall be laid in accordance with manufacturer's instructions.

HDPE pipe shall be joined by thermal butt fusion welding in accordance with the manufacturer's instructions.

PVC pipe shall be joined in accordance with CSA B181.12 modified as necessary by the manufacturer's recommendations.

Pipe shall be handled by approved methods.

Pipes shall be laid on prepared bed, true to line and grade. Ensure that barrel of each pipe is in contact with shaped bed throughout its full length. Take up and replace defective pipe. Pipe which is not in true alignment or grade or pipe which shows undue settlement after installation shall be corrected.

Socket ends shall be faced upgrade.

Do not exceed permissible deflection at joints. If the alignment requires deflection in excess of the limitations, special bends or a sufficient number of shorter lengths of pipe shall be furnished by the Contractor to provide angular deflections within the specified limits.

Jointing materials and installed pipe shall be maintained free of dirt and water and other foreign materials. Whenever work is stopped, install a removable airtight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

Pipes shall be positioned and joined with approved equipment. Excavating equipment shall not be used to force pipe sections together.

Mechanically cut pipes as required for specials, fittings or closure pieces, in a neat manner as recommended by pipe manufacturer, without damaging pipe or its coating or lining and to leave a smooth end at right angles to axis of pipe.

Pipes shall be aligned carefully before jointing.

Install gaskets where required to manufacturer's recommendations. Pipes shall be supported to minimize lateral pressure on gasket and to maintain concentricity until gasket is properly positioned.

Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed or contaminated shall be removed, cleaned, lubricated and replaced before jointing is attempted again.

Complete each joint before laying next length of pipe.

Deflection shall be minimized after joint has been made.

Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.

Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by the Engineer.

When stoppage of work occurs, pipes shall be blocked in an approved manner to prevent creep during down time.

Pipe shall not be laid on frozen bedding, water or when trench conditions are unsuitable.

Upon completion of pipe laying and after the Engineer has inspected work in place, surround and cover pipes between joints with approved granular material placed to dimensions indicated or directed.

Hand place granular material and backfill in uniform layers not exceeding 150 mm in thickness to minimum 600 mm over top of pipe. Do not dump material directly on top of pipe.

Layers shall be placed uniformly and simultaneously on each side of pipe to prevent lateral displacement of pipe.

Compact each layer to at least 95 percent of maximum density as determined in accordance with ASTM D698.

5. Pipe Penetrations

Pipe passing through walls of chambers and structures shall be provided with pipeline wall sleeves according to manufacturer's instructions. Sizing of holes in precast shall be coordinated to ensure an air and watertight seal is constructed.

7. Fittings and Valves

All fittings and valves shall be adequately supported to reduce the transmission of any undesirable load or stress on the adjoining pipe.

Each valve shall be provided with a valve box which shall be installed plumb and centered over the key nut of the valve. The valve box shall be set such that traffic loads are not transmitted to the valve. Valve box covers shall be set to the design elevations or as otherwise designated by the Engineer. Valve boxes shall provide for adjustment of the cover to a level 150 mm higher or 150 mm lower than the installed level for future adjustment of the ground surface. The box shall be supported in place by timber as detailed on the Drawings to prevent displacement on settlement of backfill. Backfill around the box shall be compacted to prevent excess settlement and displacement by traffic.

8. Chambers

Chambers shall be excavated to lines and grades shown on the Drawings in accordance with Section 02200.

Chambers shall be constructed in accordance with details shown on the Drawings, plumb and true to alignment and grade.

Precast concrete bases shall be set on 200 mm of dry mix concrete compacted to 98% of maximum density determined in accordance with ASTM D698 and extending 300 mm beyond the outside diameter of the base as shown on the Drawings.

Each successive joint shall be made watertight with specified joint material so that the assembled unit is continuous and uniform and that the interior wall surface is free of appreciable irregularities.

Surplus mortar and joint compounds shall be cleaned from the interior of chambers as work progresses.

Lifting holes shall be plugged with precast concrete plugs set in cement mortar and made watertight.

Chambers shall be constructed such that no less than two, nor more than three courses of Moduloc adjustment units will be required to adjust frames and covers to final elevation. Frames shall initially be set on the concrete at the time of construction and shall be adjusted to final elevation at the time of final grading. Final elevations shall be set to allow for specified restoration work. Chambers shall be backfilled in accordance with Section 02200.

1.04 MEASUREMENT AND PAYMENT

A. LANDFILL GAS CONTROL HEADER

1. Measurement

Measurement for each diameter of landfill gas control header will be made at the actual number of lineal metres of pipe installed as field measured by the Engineer horizontally and continuously through fittings and between changes in pipe sizes and/or to the ends of the piping installed.

2. Payment

Payment for the quantities determined above will be made at the respective unit prices per metre stipulated in the Form of Tender for Items 4a, 4b and 4c which price and payment shall be full compensation for supplying all labour, plant, materials and equipment required to remove and restore surface conditions and features; maintain existing utilities; excavate the trenches; dewatering; supply, place and compact bedding material; supply and install Series 60 HDPE pipe; supply, place and connect all pipe fittings and bends as detailed; backfill and compact trenches; dispose of excess material; perform final cleaning, flushing and dewatering of the systems; restoration; and all other miscellaneous items for which separate payment is not provided under other Items.

B. SUBHEADERS

1. Measurement

Measurement for subheaders will be made at the actual number of lineal metres of pipe installed as field measured by the Engineer horizontally between changes in pipe sizes and/or to the ends of the piping installed.

2. Payment

Payment for the quantity determined above will be made at the unit price per metre stipulated in the Form of Tender for Item 4d which price and payment shall be full compensation for supplying all labour, plant, materials and equipment required to remove and restore surface conditions and features; maintain existing utilities; excavate the trenches; dewatering; supply, place and compact bedding material; supply and install Series 60 HDPE pipe; supply, place and connect all pipe fittings and bends as detailed; backfill and compact trenches; dispose of excess material; perform final cleaning, flushing and dewatering of systems; restoration; and all other miscellaneous items for which separate payment is not provided under other Items.

C. SUBHEADER CONNECTIONS TO VERTICAL WELLS

1. Measurement

Measurement for supplying and installing valves, fittings and valve boxes for completion of the subheader connections to the vertical gas extraction wells will be made for the actual number of vertical wells installed.

2. Payment

Payment for the above will be made at the respective unit prices in the Form of Tender for Item 4e which price and payment shall be full compensation for supplying all labour, materials, plant and equipment required to complete the well connections from the vertical PVC gas well to HDPE subheader complete with all fittings, valves, valve boxes and monitoring ports; and all other miscellaneous items for which separate payment is not provided under under Items.

D. CONDENSATE DRAIN LINES

1. Measurement

Measurement for condensate drain lines will be made at the actual number of lineal metres of pipe installed as field measured by the Engineer horizontally to the ends of the piping installed.

2. Payment

Payment for the quantity determined above will be made at the unit price per metre stipulated in the Form of Tender for Item 4f which price and payment shall be full compensation for supplying all labour, plant, materials and equipment required to remove and restore surface conditions and features; maintain existing utilities; excavate the trenches; dewatering; supply, place and compact bedding material; supply and install SDR 35 PVC pipe; supply, place and connect all pipe fittings and bends as detailed; backfill and compact trenches; dispose of excess material; perform final cleaning, flushing and dewatering of systems; restoration; and all other miscellaneous items for which separate payment is not provided under other Items.

E. WATER SUPPLY LINE

1. Measurement

Measurement for water supply line will be made at the actual number of lineal metres of pipe installed as field measured by the Engineer horizontally to the ends of the piping installed.

2. Payment

Payment for the quantity determined above will be made at the unit price per metre stipulated in the Form of Tender for Item 4g which price and payment shall be full compensation for supplying all labour, plant, materials and equipment required to remove and restore surface conditions and features; maintain existing utilities; excavate the trenches; dewatering; supply place and compact bedding material; supply and install HDPE pipe; supply, place and connect all pipe fittings and bends as detailed; backfill and compact trenches; dispose of excess material; perform final cleaning, flushing and dewatering of systems; restoration; and all other miscellaneous items for which separate payment is not provided under other Items.

F. CONDENSATE TRAP CHAMBERS

Payment for each diameter of condensate trap chambers will be made at the respective lump sum price per chamber stipulated in the Form of Tender for Items 5a and 5b, which price and payment shall be full compensation for supplying all labour, plant, materials and equipment required to remove and restore surface conditions and features; maintain existing utilities; excavate for the chambers; dewatering; supply, place and compact bedding material; supply and installation of precast chambers as specified; supply, place and connect all pipe fittings and bends which comprise the condensate trap assembly as detailed; backfill and compact; dispose of excess material; perform final cleaning, flushing and dewatering of systems; restoration; and all other miscellaneous items for which separate payment is not provided under other Items.

DIVISION 3 - CONCRETE

SECTION 03000 - CONCRETE

1.0 CONCRETE

1.01 GENERAL

A. DESCRIPTION

1. Work Included

Work of this Section consists of supply and installation of concrete as specified and as shown on the Drawings. The work includes but is not necessarily limited to the following:

a) Design, supply, installation and removal of concrete formwork necessary for forming cast-in-place concrete.

b) Supply and installation of concrete reinforcement.

c) Supply and installation of cast-in-place concrete for floor slabs of the fan room, propane station, control room and moisture separator.

d) Supply and installation of cast-in-place concrete footings and piers for incinerator foundation.

e) Supply and installation of housekeeping pads for the blowers and the incinerator.

f) Supply and installation of pipe support pads and concrete fill for pipe bollards.

g) Supply and placement of grout.

2. Work Not Included

The following items of work associated with work of this Section do not form part of this Specification:

a) Embedding fence posts - Section 02443

3. Terminology

Concrete formwork shall mean formwork and falsework.

Formwork means the moulds into which concrete is placed.

Falsework means structural supports and the necessary bracing required for the support of temporary loads during construction.

Concrete reinforcement shall mean bar reinforcement and welded wire fabric.

B. REFERENCES

The publications listed below form part of this Specification to the extent specified in this Section:

1. Canadian Standards Association (CSA):

CAN3-A23.1	Concrete Materials and Methods of Concrete Construction
CAN3-A23.2	Methods of Test for Concrete
CAN3-A23.3	Code for the Design of Concrete Structures for Buildings
S269.1	Falsework for Construction Purposes
A283	Qualification Code for Concrete Testing Laboratories
G30.12-M	Billet-Steel Bars for Concrete Reinforcement
G30.3-M	Cold-Drawn Steel Wire for Concrete Reinforcement

2. American Society for Testing and Materials (ASTM):

3. American Concrete Institute (ACI):

305	Hot Weather Concreting
306	Cold Weather Concreting
SP-4, 4th Ed.	Formwork for Concrete.
347	Recommended Practice for Concrete Formwork

4. Reinforcing Steel Institute of ontario (RSIO):

Manual of Standard Practice

C. QUALITY ASSURANCE

1. General

Concrete work shall comply with the requirements of CSA CAN3-A23.1, except as specified otherwise herein.

Use ACI 347 and ACI SP-4 as a further guideline for the design and construction of concrete formwork.

2. Supplier - Installer Qualifications

Concrete shall be obtained from a certified ready-mix supplier approved by the Engineer.

3. Tolerances

Unless specified otherwise, reinforcing steel spacing shall not vary by more than 12 mm from dimensions shown on the Drawings.

D. SUBMITTALS

1. General

Comply with Section 01300 Submittals.

2. Test Reports

Submit certified mill test reports for concrete reinforcement without rolled-in grade marks.

3. Shop Drawings

Detail placement of reinforcing where special conditions occur.

Design and detail lap lengths and bar development lengths in accordance with CSA CAN3-A23.3

Each drawing submitted by the Contractor shall bear signature and stamp of qualified professional engineer registered in the Province of Ontario.

E. PRODUCT DELIVERY AND HANDLING

1. Delivery

Concrete shall be delivered in accordance with CSA CAN3-A23.1 Clause 18.4 accompanied by batch ticket information.

2. Storage and Handling

Store reinforcement in bundles with indentifying tags or markings on racks or sills that will permit easy access for identification and handling and prevent it from becoming coated with any material that would adversely affect the bond.

Individual bar identification shall be maintained after bundles are broken. Reinforcement without rolled-in grade marks or certified mill test reports shall be immediately removed from the Site.

F. JOB CONDITIONS

1. Environmental Requirements

a) Cold Weather Requirements

Cold weather requirements shall apply when the air temperature is below 5°C and shall comply with ACI 306 unless the requirements of CSA CAN3-A23.1 are more restrictive, in which case such requirements shall govern.

Obtain approval from the Engineer for proposed equipment and methods before concreting in cold weather.

Use steam at a low pressure or vented-type portable heaters to provide a suitable temperature above 5°C for placing concrete. Heaters shall be blocked up and concrete shall be protected from local concentrations of heat. Salamander type heaters shall not be used.

b) Hot Weather Requirements

Hot weather requirements shall apply when the air temperature is above 25°C and shall comply with ACI 305 unless the requirements of CSA CAN3-A23.1 are more restrictive, in which case such requirements shall govern. The Contractor shall obtain approval from the Engineer for proposed equipment and methods before concreting in hot weather.

2. Protection

Protect concrete materials before, during and after installation and protect installed work and materials of other Sections.

Prevent mechanical disturbance of concrete immediately after placement and during the specified curing period. The Contractor shall prevent damage to finished concrete.

1.02 PRODUCTS

A. GENERAL

Concrete materials shall comply with CSA CAN3-A23.1 except as specified otherwise.

B. MATERIALS

1. Formwork

Formwork material shall comply with CSA CAN3-A23.1, Clause 11 and CSA S269.1 and shall be suitable to achieve the specified finish requirements. Formwork shall be subject to review by the Engineer. The Contractor shall use new plywood forming material to form concrete surfaces exposed to view.

The use of alternate material such as metal shall be approved by the Engineer.

2. Form Ties

Form ties shall be removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.

3. Form Coatings or Release Agents

Form coatings or release agents shall not impair or prevent adhesion of required surface treatments and shall be subject to review by the Engineer. When used, the Contractor shall comply with manufacturer's specifications.

4. Reinforcing Steel Bars

Bars for reinforcement shall be hot-rolled deformed bars complying with CSA G30.12 and shall be Grade 400 unless shown otherwise on the Drawings.

5. Tie Wire

Wire for tying reinforcement shall be 16 gage, black annealed wire complying with CSA G30.3.

6. Bar Supports

Bar supports shall be sufficient in number and strength to carry the reinforcement they support and prevent displacement by workers or equipment before and during concreting. Bar supports shall be precast concrete blocks, plastic or wire.

7. Spacers

Side form spacers shall be of a type and material that will not cause blemishes, rust spots, or spalling of the exposed concrete surface.

8. Cement

Cement shall be gray, Portland cement and shall be obtained from a single manufacturing source approved by the Engineer.

Portland cement shall comply with CSA CAN3-A5.

9. Aggregate

Aggregates shall be normal density.

10. Water

Water shall comply with CSA CAN3-A23.1, Clause 4 except that it shall be free from injurious amounts of oil, acid, alkali, organic matter, sediment or any other deleterious substance.

11. Admixtures

Chemical admixtures shall comply with CSA CAN3-A23.1.

Air entraining admixtures shall comply with ASTM C260 "Darex AEA" (W.R. Grace Co.) or MB-AE10 (Master Builders) or approved equal.

Calcium chloride shall not be used as an admixture.

12. Grout

Use a non-metallic grout, M-Bed manufactured by Steinson Limited or an approved equivalent for all grouting applications. Comply with the manufacturer's recommendations with regard to handling, mixing and installation.

13. Other Materials

Other materials shall be selected by the Contractor subject to the Engineer's approval prior to use.

C. MIXES

Concrete shall be proportioned in accordance with Alternative 1, Table 11, CSA CAN3-A23.1. The Contractor shall assume responsibility for concrete mix proportions.

The following class of concrete shall be used in the Works unless otherwise noted:

Specified Strength	25 MPa
Slump,	75 mm
Air Content	6% +/- 1% by volume
Size of Course Aggregate	20 mm Ø

D. FABRICATION AND MANUFACTURE

Reinforcement shall be fabricated in accordance with CSA CAN3-A23.1 to shapes shown on the Drawings and within fabricating tolerances specified in RSIO.

1.03 EXECUTION

A. PREPARATION

1. General

Verify that correct types and sufficient quantities of bar supports and spacers are delivered in sufficient time to avoid delay in placement of reinforcement.

Examine the Drawings and other Sections of the Specification to determine provisions for openings, reglets, chases, embedded parts, and other items in the forms.

Facilities, materials and equipment necessary for protection of concrete in place from the effects of hot and/or drying conditions and cold weather conditions as applicable, shall be provided and be on hand prior to start of concrete placement.

2. Bonded Joints

Where concrete is to be placed to previously hardened concrete or rock surfaces, and shown to be bonded on the Drawings, surfaces shall be prepared in accordance with CSA CAN3-A23.1.

3. Methods of Placing, Curing and Protection

Obtain approval from the Engineer for methods of conveying, spreading, consolidating, finishing, curing and protecting concrete at least 24 hours prior to placing concrete.

B. INSPECTION

Notify the Engineer at least 24 hours in advance of intention to place concrete.

Concrete shall not be placed until the Engineer has inspected foundations, forms, reinforcing steel, embedded parts, methods of mixing, conveying, spreading, consolidating, finishing, curing and protecting concrete or other work specified or required to ensure the proper execution of the work of this Section.

Notify the Engineer, at least 24 hours in advance of completion of concrete reinforcement placing, to permit time for inspection, final adjustment and review by the Engineer prior to placing concrete.

Notify the Engineer of intention to remove formwork and falsework and obtain approval from the Engineer prior to proceeding.

C. INSTALLATION

1. Formwork

a) Construction

Comply with CSA CAN3-A23.1, CSA S269.1 and as specified herein.

Provide 20 x 20 mm chamfer on external corners and edges of concrete exposed to view, unless otherwise shown on the Drawings.

Ensure that anchors, inserts, angles and other such items to be set in concrete are properly and adequately secured within the forms.

Forms that cannot be properly cleaned or repaired to meet the requirements of this Section shall be immediately removed from the Site.

Construct forms tight fitting to prevent cement migrating out of plastic matrix.

Obtain approval from the Engineer for use of earth forms. The Contractor shall hand trim sides and bottoms and shall remove loose earth from earth forms before placing concrete.

b) Removal of Falsework and Formwork

Comply with CSA CAN3-A23.1 and CSA S269.1 and as specified herein.

Falsework and formwork shall be removed only after concrete has attained sufficient strength to prevent damage to corners and edges and the concrete structure adequately supports its own weight and construction loads likely to be imposed.

Removal of concrete formwork shall not occur for 24 hours following placement of concrete, providing the curing requirements of CSA CAN3-A23.1 are satisfied.

Notwithstanding the specified minimum times, be responsible for any damage or injury to the concrete caused by removing forms or falsework prior to the concrete gaining sufficient strength.

2. Reinforcement

a) General

Concrete reinforcement shall be installed as shown on the Drawings and in accordance with CSA CAN3-A23.1, Clause 12.

Bar support systems and patterns shall comply with RSIO.

Make only those splices shown on the Drawings and in accordance with CSA CAN3-A23.3.

Reinforcement shall be placed and tied to maintain specified tolerances during installation and placement of concrete.

b) Obstructions

In the event conduits, piping, inserts, sleeves or other items interfere with reinforcement placing the Contractor shall immediately notify the Engineer and shall obtain approval from the Engineer for adjustments.

Do not cut bars to clear obstructions without approval from the Engineer.

c) Field Bending

Do not field bend reinforcement except as authorized by the Engineer.

When field bending is authorized, bend without heat, applying a slow and steady pressure.

Bars which develop cracks or splits shall be replaced.

3. CAST-IN-PLACE CONCRETE

a) General

Place, finish, cure and protect concrete in accordance with CSA CAN3-A23.1.

b) Curing

Alternative (c) specified in CSA CAN3-A23.1 shall be deleted from this Specification. Absorptive mat or fabric specified in Section (b) shall be applied with generous laps to ensure total coverage. Alternative (f) shall include curing of formed surfaces by leaving forms in position, provided that forms capable of moisture loss such as ply-forms shall be sprinkled with water from time to time to avoid moisture loss from concrete. Curing by direct hand sprinkling on concrete will not be a method approved by the Engineer.

Curing compounds shall not be used on concrete surfaces to which subsequent concrete, tile, paint or other materials are to be bonded unless otherwise approved by the Engineer.

Curing by continuous sprinkling shall be done in a manner which is not harmful to the finished concrete surface. Initial curing shall be by atomized water spray.

c) Protection

Protect exposed concrete surfaces from shrinkage cracking whenever the rate of evaporation of surface moisture exceeds the rate of bleeding of the concrete. The rate of evaporation of surface moisture shall be estimated using Figure D-1, Appendix D, CSA CAN3-A23.1.

d) Finishing of Unformed Surfaces

Unformed surfaces shall be finished as follows:

1. screed, float and apply steel trowel finish;
2. tool edges and joints; and
3. tolerance shall be 1/4-inch in 10 feet.

Floating shall mean mechanical floating, bull floating or darbying to meet specified tolerance.

e) Finishing of Formed Surfaces

Formed surfaces shall be finished in accordance with CSA CAN3-A23.1.

f) Isolation Joints

Locate and form isolation joints to widths and locations shown on the Drawings.

Joint filler shall be installed in accordance with the manufacturer's instructions.

D. FIELD QUALITY CONTROL

1. General

Evaluation of concrete quality will be the responsibility of the Engineer. Field quality control shall comply with CSA CAN3-A23.1, Clause 17.

The Engineer will sample and test delivered concrete and such tests will be at the expense of the Owner except as specified otherwise. Copies of test reports will be supplied to the Contractor on request.

If any concrete materials or concrete work or any construction methods used do not meet the requirements of this Section, the Engineer may reject immediately, affected materials or work, or may carry out additional measures as specified in Clause 17.6 of CSA CAN3-A23.1 before deciding whether or not to reject such materials or work. Additional measures and repair of any resulting damage to the Works will be at the expense of the Owner, if tested materials or work meet the requirements of this Section of the Specification and shall be at the expense of the Contractor if tested materials or work do not meet requirements of the Specification.

2. Sampling Concrete

When concrete is conveyed from delivery equipment to point of deposition, samples will be taken at point of deposition.

1.04 MEASUREMENT AND PAYMENT

Payment for concrete work will be made at the lump sum price stipulated in the Form of Tender for Item 6, which price and payment shall be full compensation for the supply and installation of all concrete footings, all granular base preparation for slabs, floor slabs, pipe supports, housekeeping pads; and all other miscellaneous items for which separate payment is not provided under other Items.

DIVISION 5 - METALS

SECTION 05500 - METAL FABRICATIONS

1.0 METAL FABRICATIONS

1.01 GENERAL

1. Work Included

Work of this Section consists of supply and installation of metal fabrications including connection design as specified and as shown on the Drawings.

Metal fabrications shall include but not necessarily be limited to the following:

1. moisture separator shelter
2. pipe bollards
3. anchor bolts and base plates

2. Related Work Specified in Other Sections

Following items of work related to work of this Section are specified in other Sections as noted:

1. supply of anchor bolts for prefabricated building - Section 13121; and

2. steel pipe hangers and supports - Section 15050.

3. Technical Requirements Specified in Other Sections

Following items of work related to work of this Section are specified in other Sections as noted:

1. surface preparation and shop painting metal fabrication - Section 09900; and

2. supply and installation of prefabricated buildings - Section 13121.

4. Terminology

Pipe supports shall mean steel pipe support brackets and saddles.

Pipe sleeves shall mean pipe sleeves, excluding pipe sleeves for anchor bolts, and includes anchors to concrete.

B. REFERENCES

The publications listed below form part of this Specification to the extent specified in this Section:

1. Canadian Standards Association (CSA):

CAN3-G40.21	Structural Quality Steels.
CAN3-S16.1	Steel Structures for Buildings (Limit States Design).
W47.1	Certification of Companies for Fusion Welding of Steel Structures.
W59	Welded Steel Construction. (Metal-Arc Welding).
CAN3-A23.1	Concrete Materials and Methods of Concrete Construction.

2. American Society for Testing and Materials (ASTM):

A307	Standard Specification for Carbon Steel Externally Threaded Standard Fasteners.
A325	Standard Specification for High-Strength Bolts for Structural Steel Joints.

3. Canadian Institute of Steel Construction (CISC):

CISC	Code of Standard Practice for Structural Steel.

4. Steel Structures Painting Council (SSPC):

PA1	Paint Application Specification No. 1 Shop, Field, and Maintenance Painting.

C. QUALITY ASSURANCE

1. General

Comply with CSA CAN3-S16.1.

Weld in accordance with CSA W59.

2. Supplier-Installer Qualifications

Fabricators and erectors shall be certified by the Canadian Welding Bureau in accordance with CSA W47.1, Division 3.

D. SUBMITTALS

1. General

Comply with Section 01030.

2. Shop Erection Drawings

Submit shop and erection drawings.

Shop drawings shall show materials and fabrication details.

Erection drawings shall show general arrangement of work of this Section and shall identify each member to be erected.

E. JOB CONDITIONS

1. Protection

Protect metal fabrications before, during and after installation and protect installed work and materials of other Sections.

Protect shop painted or galvanized surfaces of metal fabrications from damage and prevent contamination of painted surfaces or surfaces specified to be painted.

Do not use metal fabrications to be embedded in concrete as a means of temporary support.

Protect metal fabrications from marking and distortion.

2. Sequencing and Scheduling

Deliver metal fabrications in such sequence to limit the need for storage at Site and to permit efficient erection.

1.02 PRODUCTS

A. GENERAL

Steel for metal fabrications shall comply with CSA CAN3-G40.21, Grade 300 W except as otherwise specified.

B. MATERIALS

1. Anchor Bolts

Steel for anchor bolts shall comply with ASTM A307.

2. Pipe Bollards

Pipe bollards shall be constructed of Schedule 40 steel pipe complying with ASTM A53.

3. Bolts

High strength bolts shall comply with ASTM A325; other bolts shall comply with ASTM A307.

4. Expansion Bolts

Expansion bolts shall be Wej-It concrete anchors as manufactured by Wej-It Expansion Products Inc. The anchor shall be the double wedge expansion type, made of cold drawn steel, having the accredited pull out and shear values as published by Wej-It. Sizes and locations shall be in accordance with the Drawings.

5. Primer

Primer, where required, shall comply with Section 09900.

6. Galvanizing

Galvanizing, where required, shall comply with CSA G164.

C. DESIGN CRITERIA

Design connections not completely detailed on the Drawings in accordance with CSA CAN3-S16.1. Members have been designed as simply supported unless otherwise specified on the Drawings.

D. FABRICATION AND MANUFACTURE

1. General

Fabricate metal fabrications in strict accordance with reviewed shop drawings and specified references.

Joints shall be accurately coped or mitered or otherwise fitted in accordance with best current practice. Welds in exposed to view connections shall be neatly ground and finished to match the texture of the material in which they occur.

Connections shall be welded except where shown otherwise on the Drawings.

Fabricate or assemble metal fabrications in the shop unless impractical.

Verify dimensions of existing work before commencing fabrication.

Weld in accordance with CSA W59.

Holes shall be drilled or punched.

2. Shop Painting

Prepare surfaces to receive shop paint in accordance with Section 09900.

Shop paint surfaces other than those to be galvanized or embedded in concrete in accordance with Section 09900.

1.03 EXECUTION

A. PREPARATION

Coordinate installation of metal fabrications with work of other Sections ensuring proper sequencing and support.

Where metal fabrications are specified to be embedded in concrete, ensure material is on hand sufficiently in advance of concrete operations.

B. INSPECTION

Prior to commencement of installation, inspect work of other Sections, identifying improperly installed connecting parts and notify the Engineer immediately.

C. INSTALLATION

1. General

Connections made in the field shall be bolted unless otherwise specified or unless welding is specified on the Drawings.

Install metal fabrications in accordance with reviewed erection drawings.

2. Touch-Up

Touch up painted surfaces of bolts, rivets, welds and burned or scratched surfaces at completion of erection with same type of paint and to same thickness as shop coat including cleaning and painting of field connections not previously painted and damaged or otherwise defective paint and rusted areas in accordance with Section 09900.

Repair galvanized surfaces in accordance with Section 09900.

3. Embedded Parts

Set metal fabrications to be embedded in concrete to conform to dimensions and locations shown on the Drawings and in accordance with CSA CAN3-A23.1, Clause 13.

Rigidly secure embedded parts during concrete operations to ensure proper location as shown on the Drawings.

Any displacement whether caused by movement of forms or movement of metal fabrications relative to the forms or otherwise shall be corrected to their specified location.

Methods used to secure embedded parts in position and to ensure that they are held in their required position shall be subject to review by the Engineer.

Coordinate installation of embedded parts with Section 03000.

1.04 MEASUREMENT AND PAYMENT

No separate payment will be made for the work of this Section. Payment for metal fabrications will be included in the lump sum price stipulated in the Form of Tender for Item 8.

DIVISION 9 - FINISHES

SECTION 09900 - PAINTING

1.0 PAINTING

1.01 GENERAL

A. DESCRIPTION

1. Work Included

Work of this Section consists of supply and application of paint as specified. The work includes but is not necessarily limited to the surface preparation and painting of the following:

a) Exposed piping;
b) Piping supports and equipment frames;
c) Steel framing for moisture separator shelter;
d) Moisture separator; and
e) Hollow metal doors and frames.

2. Related Work Specified in Other Sections

The following items of work related to work of this Section are specified in other Sections as noted:

a) Shop priming mechanical equipment - Section 15000; and
b) Pre-engineered buildings - Section 13121.

B. REFERENCES

The publications listed below form part of this Specification to the extent specified in this Section:

1. Steel Structures Painting Council (SSPC):

SP1	Surface Preparation Specification No. 1 - Solvent Cleaning
SP3	Surface Preparation Specification No. 3 - Power Tool Cleaning
SP5	Surface Preparation Specifiction No. 5 - White Metal Blast Cleaning
SP6	Surface Preparation Specification No. 6 - Commercial Blast Cleaning
PA1	Paint Application Specification No. 1 - Shop, Field and Maintenance Painting

C. QUALITY ASSURANCE

1. General

The application of paints to steel surfaces whether in the shop or in the field shall comply with SSPC-PA1, unless paint manufacturer's recommendations are more restrictive, in which case such recommendations shall govern.

The application of paints to surfaces other than steel shall comply with SSPC-PA1 to the extent practical.

Reference to the American Arbitration Association contained in various Steel Structures Painting Council references shall not apply to this Section of the Specification.

D. SUBMITTALS

1. General

Comply with Section 01030 Submittals.

2. Names of Manufacturers

When specific manufacturers have not been named in this Section, at least 14 days prior to commencing painting, submit names of paint manufacturers proposed for the Works. Submit colour schedules for selection by the Region. Manufacturers shall not be changed without approval from the Engineer.

3. Manufacturer's Recommendations

Paint manufacturer's recommendations shall be obtained concerning all aspects of use for each type of paint specified or proposed, as the case may be.

At least 14 days prior to commencing painting, notify the Engineer in writing of any requirements in this Section which are not compatible with paint manufacturers' recommendations.

E. PRODUCT DELIVERY AND HANDLING

1. Delivery

Deliver products as specified in SSPC-PA1, Clause 5.1.

2. Storage and Handling

Only approved materials shall be stored at the Site in a well ventilated and heated area designated by the Engineer at a minimum ambient temperature of 10°C.

F. JOB CONDITIONS

1. Environmental Requirements

Comply with SSPC-PA1, Clause 6.

2. Protection

Take necessary precautionary measures to prevent fire hazards and spontaneous combustion.

Sufficient drop cloths, shields and protective equipment shall be furnished to prevent spray or dropping from fouling surfaces not specified to be painted including surfaces within storage and preparation area.

Waste, cloths and materials which may constitute a fire hazard shall be placed in closed metal containers and removed daily from the Site.

Remove electrical plates, surface hardware, fittings and fastenings, prior to painting operations. Such items shall be carefully stored, cleaned and replaced on completion of work in each area. Solvent shall not be used to clean hardware that will remove permanent lacquer finish on some of these items.

Adjacent properties, landscaping, watercourses and public, incuding vehicles, shall be protected from any damage due to operations.

Adjacent surfaces not specified to be painted, shall be protected from any damage due to operations and if damaged, clean and restore such surfaces to original condition unless specified otherwise.

Primer, paint or pretreatment shall be applied as soon as practical after surface has been cleaned and prior to surface deterioration.

In the event that rusting occurs after completion of surface preparation, surfaces shall be cleaned again as specified.

Prevent contamination of cleaned surfaces by salts, acids, alkali, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats of paint. Remove such contaminants from surfaces and apply paint immediately.

Cleaned and freshly painted surfaces shall be protected from dust or other foreign matter.

The following surfaces, unless otherwise specified, shall not be surface prepared and painted:

1. insulation
2. inside surfaces of tank, vessels, piping and exchangers
3. glass, tile or ceramic surfaces
4. name plates or identification tags
5. non-ferrous metal or alloy steel such as brass, aluminum, monel or stainless steel
6. valve stems or other machined contact surfaces
7. steel surfaces to be fire proofed
8. contact surfaces of structural steel members to be joined with friction type connections
9. concrete floors

4. Sequencing and Scheduling

Surface preparation shall be discontinued each day in sufficient time to permit the properly prepared surfaces to be primed before the end of the working day.

1.02 PRODUCTS

A. GENERAL

1. Paint System

In each Paint System paints of same type and paints specified by manufacturers' brand names shall be products of same paint manufacturer.

For each Paint System, paints shall be applied in order listed after surface preparation in definition of Paint System.

B. MATERIALS

Surfaces to be coated with paint systems are specified in the following:

a) Galvanized Steel — Prep as specified

P = Vinyl Wash Primer (13 Y-8) - 1 coat - 0.3-0.5 mm thickness

F = Alkyd Enamel (20 series) - 2 coats - 1.5-2.0 mm thickness

b) Ferrous Metals Shop applied 13-Y-602

P = Epoxy Ester Phenolic (13-Y-602) - Prep - SP3 - 1 coat - 1.5-2.0 mm thickness

F = Alkyd Enamel - 2 coats - 1.5-2.0 mm thickness

c) Plastic Pipe and Fibreglass Reinforced Plastic

P = Surface Prep - SP1 and sand paper

F = Alkyd Enamel - 2 coats - 1.5-2.0 mm thickness

It is brought to the Contractor's attention that the prime coats specified in the painting systems are in addition to shop applied primers for field painted items.

C. FABRICATION AND MANUFACTURE

Shop painting shall be performed in accordance with SSPC-PA1, Clause 8.

1.03 EXECUTION

A. PREPARATION

Inspect surfaces prior to commencing work of this Section and report any defects or deficiencies, in writing, to the Engineer.

B. INSPECTION

Notify the Engineer 48 hours before commencing painting.

Paint shall not be applied until prepared surfaces or previously applied paints have been inspected and approved by the Engineer.

C. PERFORMANCE

1. Surface Preparation

a) General

Except where specified otherwise in this Section, surfaces shall be prepared in accordance with paint manufacturer's recommendations. As a minimum requirement in all cases, surfaces shall be dry and free from loose rust, loose mill scale, loose paint, oil, grease, dirt, dust and other foreign matter at time of painting.

Before prime coat is applied, edges of adjacent previously painted surfaces shall be feathered.

2. Painting

a) General

Field and shop painting shall be performed in accordance with SSPC-PA1.

b) Piping, Valves and Pumps

Coat with primer to a dry film thickness of 2.0 - 3.5 mils followed by two (2) coats finish to dry film thickness of 1.5 to 3.0 mils per coat.

D. ADJUSTMENT CLEANING

Touch-up and repair of paint defects will be performed using same surface preparation, paint system and products as specified for adjacent surfaces, except as otherwise specified.

Surfaces previously blast cleaned as specified need only be power wire brush cleaned in accordance with SSPC-SP3.

Touch-up and repair galvanized surfaces with Carbozinc 11 and Carbo Line 4631 as supplied by Corrosion Services Limited in accordance with the manufacturer's recommendations.

1.04 MEASUREMENT AND PAYMENT

Payment for painting will be made at the lump sump price stipulated in the Form of Tender for Item 7, which price and payment shall be full compensation for painting as specified; and all other miscellaneous items for which separate payment is not provided under other Items.

DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13121 - PRE-ENGINEERED BUILDINGS

1.0 PRE-ENGINEERED BUILDINGS

1.01 GENERAL

A. DESCRIPTION

1. Work Included

Work of this Section consists of design, supply and erection of pre-engineered buildings for the fan room and electrical room of the gas control plant as specified and as shown on the Drawings.

Pre-engineered buildings shall mean self-framing buildings designed and constructed by a recognized building manufacturer.

2. Related Work Specified In Other Sections

Following items of work related to work of this Section are specified in other Sections as noted:

1. Moisture separator shelter - Section 05500
2. Concrete - Section 03000

3. Terminology

Self framing buildings, comprising shed and gable types, shall mean buildings which transfer their external loads to the foundation via the exterior panels or sheeting.

B. REFERENCES

Publications listed below form part of this Specification to the extent specified in this Section:

1. Canadian Standards Association (CSA):

CAN3-G40.21	Structural Quality Steels.
CAN3-S16.1	Steel Structures for Buildings (Limit States Design).
CAN3-S136	Cold Formed Steel Structural Members.
W59	Welded Steel Construction (Metal-Arc Welding).

W47.1	Certification of Companies for Fusion Welding of Steel Structures.
W48.1	Mild Steel Covered Arc-Welding Electrodes.

2. American Society for Testing and Materials (ASTM):

A307	Specification for Carbon Steel Externally Threaded Standard Fasteners.
A325	Standard Specification for High-Strength Bolts for Structural Steel Joints.
A446M	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
A525M	Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process [Metric].

3. National Building Code of Canada (NBC) including Supplement No. 4.

4. Canadian Sheet Steel Building Institute (CSSBI):

Bulletin No. 9 (August 1983)	Care and Maintenance of Pre-finished Sheet Steel Building Products.
Pub. No. 386 (December 1979)	Metric Standard for Sheet Steel Cladding.

C. QUALITY ASSURANCE

1. General

Comply with CSA CAN3-S136 and CSA CAN3-S16.1.

Weld steel in accordance with CSA W59.

Design shall be by qualified professional engineer registered in the Province of Ontario.

2. Supplier - Installer Qualifications

Steel welders shall be certified by the Canadian Welding Bureau in accordance with CSA W47.1.

D. SUBMITTALS

1. General

Comply with Section 01030 - Submittals.

Should the Contractor propose an alternate supplier to the First Named Building, a complete submission is required detailing all aspects of the proposed building and the changes required to the foundations and details shown on the Contract Drawings. In this event, each drawing and design calculation sheet submitted shall bear the signature and stamp of a qualified professional engineer registered in the Province of Ontario.

2. Shop and Erection Drawings

Submit detailed fabrication and erection drawings.

3. Design Calculations

Submit design calculations before fabrication commences.

4. Foundation Loading and Anchorage Requirements

Submit drawings indicating foundation design loads for building and anchorage layout.

E. PRODUCT DELIVERY AND HANDLING

1. Delivery

Deliver materials to Site as required to reduce the need for storage.

Deliver materials to Site bearing manufacturer's labels and seals intact.

Comply with CSSBI Bulletin No. 9, Clause 4.

2. Storage and Handling

Comply with CSSBI Bulletin No. 9, Clause 5.

Store materials in a weathertight, damp free structure and in accordance with manufacturer's recommendations.

F. JOB CONDITIONS

1. Protection

Protect material from damage during installation or handling operations.

Clean up cuttings, strappings, packaging material and other debris each working day and dispose of in a suitable manner.

Keep units free of temporary construction loads until permanently secured.

Protect galvanized or other finished surfaces from damage.

Comply with CSSBI Bulletin No. 9, Clause 6.

1.02 PRODUCTS

A. GENERAL

Primary structural members of the self-framing building are the exterior wall panel or sheathing.

Secondary structural members shall include purlins, base angle or channel header, jamb, sills and other miscellaneous structural components.

B. MATERIALS

1. Pre-Fabricated Buildings

The proposed gas control plant shall consist of two prefabricated self-framing buildings installed as shown in the Contract Drawings. The fan room shall be an ARMCO TEC-LINE 2 (16'x24') or an approved equivalent. The control room shall be an ARMCO LS-1 (6'8"x9'4") or an approved equivalent.

2. Cladding

The exterior walls shall be prefinished sculptured panels as shown on the Drawings, fabricated from zinc coated steel to ASTM A446, minimum Grade B and shall have a Zinc Coating Designation of Z275 in accordance with ASTM A525 unless specified otherwise.

The roof panels are flush faced aluminized steel panels with interlocking ribs. Interior wall panels shall be prefinished steeliner panels or an approved equivalent.

3. Bolts

Bolts, nuts and washers for structural steel shall comply with ASTM A325.

Anchor bolts shall comply with ASTM A307.

4. Vapour Barrier

Vapor barrier shall be 150 micrometre clear polyethylene film with tape for sealing as recommended by the manufacturer.

5. Insulation

Insulation for walls shall be AF110 semi-rigid fibreglass, 75 mm thick.

Insulation of ceilings shall be AF180 fibreglass, 150 mm thick.

6. Sealant

Sealant shall comply with manufacturer's recommendations.

7. Fasteners

Fasteners shall be provided and shall be sized by the building manufacturer to meet load requirements and to maintain a watertight installation. Heads of fasteners in areas exposed to view shall have matching colour to wall panel material being fastened.

8. Purlins and Girts

Purlins and girts shall be fabricated from zinc-coated (galvanized) sheet steel conforming to ASTM A446, minimum Grade B with a minimum Zinc Coating Designation of Z275 in accordance with ASTM A525.

9. Closures and Flashings

Closures and flashings shall be same material, thickness and finish as the respective interior and exterior sheets.

10. Personnel Doors, Frames and Hardware

Steel doors shall be of the flush type with provision for cutouts where specified.

Hollow metal doors and frames shall be sized as specified on the Drawings.

Door thickness shall be 45 mm unless specified otherwise.

The type of steel, gauge and manufacturing style shall consist of wipe coated galvanized steel (designation WC) shall comply with ASTM A525, class designation ZF001.

Galvanized steel shall be mill phosphatized where specified to be subsequently painted.

The door cores shall consist of vertical stiffening with steel ribs and voids filled with semi-rigid fibrous insulation, minimum density 24 kg/m^3. Insulation shall be securely bonded to the inside face of both surface sheets. Vertical stiffeners shall be spot welded to face sheets at maximum 150 mm centres.

The frames shall be sawn or mechanically mitred and continuously welded on the inside of the profile. Welded joints shall be ground to a smooth, uniform finish.

Steel doors and frames shall be manufactured in accordance with Canadian Manufacturing Specification for Steel Doors and Frames, except where specified otherwise.

Grind welded corners and joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.

Prepare the doors to accept the following hardware:

a) Hinges - 1 1/2 pair per door Stanley FBB168, Hager BB1168 or equivalent.

b) Latches and Locksets - Provide single doors with pull handle, panic set and key on exterior. Provide pull handle, panic set and key on active side of double door set. Provide surface mounted bolts (top and bottom) on passive side of double door set. Panic Sets will be Sargeant Model No. 9863STS 32D complete with Corbin lock cylinders No. 5211C15 which are keyed alike to the Region's common lock system (Submaster B).

c) Door Closers - Provide single doors and active side of double doors with an LCN Smoothee Series 4010 or 4020 for the particular door operation.

d) Door Sweeps, Thresholds and Weatherstripping - Provide heavy duty weatherstripping, commercial grade door sweeps and thresholds to weatherproof all exterior doors. Provide an astragal for the double door set.

Ensure that the hollow metal frames are prepared and reinforced to accept the above-noted hardware.

11. Blowout Panels

Blowout panels will be custom fabricated with lightweight panels of the same materials as the building. The panels shall have an insulated core and be sized for the conventional window frame opening as indicated in the drawings and shall weigh less than 7.3 kg/m^2 (1.5 lb/ft^2).

The blowout panel fasteners will be shear pins or similar fasteners such that they will provide explosion relief under a pressure of one KPA (20 p.s.f.).

12. Window

Window frame will be supplied with an insulated hollow metal frame and complete with an insulated glass unit conforming to CAN2-12.8 M76.

C. DESIGN CRITERIA

1. General

Base plan dimensions will be as shown on the Drawings. Building components shall suit dimensions shown on the Drawings.

The prefabricated building, in addition to meeting the requirements of the National Building Code, the minimum standards implied by the selection of the First Named Building and the design loads specified for this area, must provide one additional purlin which shall be placed as directed by the Mechanical Division 15 and as required for overhead pipe support of the incoming gas header pipe.

D. FABRICATION AND MANUFACTURE

1. Primary Framing

Fabricate structural members as indicated in accordance with CSA CAN3-S16.1 and in accordance with reviewed shop drawings.

Shear, form, punch and weld structural members in shop.

Bolt primary building frame connections.

Provide punched holes for attachment of other work.

Reinforce openings to maintain design strength of displaced cladding or structural members.

2. Secondary Framing

Roll form purlin and girt sections and stiffen as required.

Provide wind bracing in both roof and wall bays as required.

Provide struts where required to distribute wind load into braced bays.

Provide flange bracing where required to restrain inner flange of primary framing, when in compression.

Provide eave struts bolted to rigid frame.

3. Cladding

Fabricate cladding in accordance with CSA CAN3-S136 and CSA CAN3-S157, where applicable.

Exterior sheet shall be factory preformed with male and female lipped edges.

Exterior corners for walls shall be same material, finish and profile as adjacent siding material, shop cut and brake formed to right angle.

4. Closures and Flashings

Flashings and closures that cannot be formed by manufacturer's production line machinery shall be fabricated on a bending brake to eliminate waves and ensure accurate bend angles.

Bend edges of flashings to prevent dimpling at screw fastenings.

2. Framing

Erect wall panels true and plumb on foundations to the elevations shown on Drawings free from distortion or defects detrimental to appearance and performance.

Introduce temporary bracing or shoring wherever necessary to take care of all loads to which the structure may be subjected during erection. Do not remove such bracing as long as it may be required for safety.

Securely bolt work as erection progresses to take care of all dead load, wind and erection stresses. Do not commence final bolting until work has been properly aligned.

Correct slight inaccuracies in punching by reaming, but do not enlarge holes by drifting.

Obtain written approval from the Engineer prior to site cutting or making adjustments which are not shown on the shop drawings.

Secure wall assemblies ensuring a completed installation free from noise, rattles, wind whistles, or noise due to thermal movement.

Secure girts to structural wall supports.

Apply insulation to form continuous thermal barrier.

Ensure continuous vapour barrier seal by pre-caulking female joints.

Install exterior sheet to internal girts with concealed fasteners.

3. Roof Cladding

Install roof assemblies including drain gutters and down spouts to grade to manufacturer's instructions.

Secure roof liner sheets to structural purlins with self tapping screws. Terminate sheet ends over structural supports.

Secure side laps with self-tapping screws.

Continuous seal end and side laps.

Provide perforated closure strips at eaves which will allow passage of air between exterior cladding and insulation.

Allow for thermal movement of roof sheets with approved watertight fastening method.

4. Insulation

Install insulation to manufacturer's instructions.

Ensure that surfaces to which insulation is applied are dry.

Install insulation and vapour barrier systems to maintain continuous and complete thermal/vapour protection for building spaces and elements except do not use vapour barrier with acoustical insulation.

Ensure surfaces which are to receive insulation are clean, free of deleterious matter and are sufficiently level to allow the proper installation of insulation.

Cut and trim insulation neatly to fit spaces. Butt edges and end tight. Fit insulation tight against items which protrude through walls and roofs for proper installation of insulation.

5. Liner Sheets

Prime and seal joints as work progresses to form a complete unbroken vapour barrier.

6. Closures and Flashings

Install closures and flashings tight to contours of sheets.

Prime and seal joints between closures, flashings, and liners including joint between wall base and grade beam and joint between top of wall and roof.

7. Painting

Touch up shop painted surfaces in accordance with Section 09900 - Painting.

Touch up galvanized surfaces in accordance with Section 09900.

8. Doors, Frames and Hardware

Install personnel doors as shown on the Drawings.

Install doors, frames and hardware in accordance with the manufacturer's instructions.

Seal joints between door frames and wall panels.

Touch up damaged surfaces.

9. Window and Blowout Panels

Install window and blowout panels as shown on the Drawings and in accordance with the manufacturer's recommendations.

10. Sealing

Seal joints in accordance with manufacturer's recommendations.

D. ADJUSTMENT AND CLEANING

Remove sealant smears with recommended solvent.

Adjust and lubricate doors.

Adjust weatherstripping and door seals.

Leave materials clean.

1.04 MEASUREMENT AND PAYMENT

Payment for the pre-engineered buildings will be made at the lump sum price stipulated in the Form of Tender for Item 8, which price and payment shall be full compensation for the supply and installation of the prefabricated buildings; supply and installation of the moisture separator shelter and all other miscellaneous items for which separate payment is not provided under other Items.

SECTION 13560 - BURNER SYSTEM

1.0 BURNER SYSTEM

1.01 GENERAL

A. DESCRIPTION

1. Work Included

Work of this Section consists of design, supply and erection of a burner system as specified and as shown on the Drawings.

The burner system will include but is not necessarily limited to the following:

1. vertical cylindrical drum lined with a refractory material, having a burner arrangement at its base;
2. flame ignition system, flame scanner system, temperature control system, flame arrestor, gas control valve, and control panel; and
3. control panel to include temperature controller and valve controller, to control the discharge gas temperature and gas flow to the burner respectively.

2. Work Not Included

1. Propane gas supply line to flare - Section 15050
2. Conduit and wiring to control panel - Section 16000
3. Conduit and wiring between termination points at control panel and flare control devices - Section 16000

3. Technical Requirements Specified In Other Sections

The work of this section shall be carried out in accordance with the technical requirements of the Sections noted below:

1. Concrete - Section 03000
2. Metal Fabrications - Section 05500
3. Mechanical - Section 15000
4. Electrical - Section 16000

2. Shop Drawings and Product Information

Provide detail shop drawings for review and approval by the Engineer. Provide manufacturer's product data sheets for all equipment to be utilized in the burner system for review and approval by the Engineer. Provide a detailed written description of the operation of the burner system in conjunction with the shop drawings.

3. Operating and Maintenance Manuals

Provide to the Engineer four copies of all operating and maintenance instructions for all major items of equipment and include in a detailed operating and maintenance manual.

E. PRODUCT DELIVERY AND HANDLING

1. Delivery

Manufacture the enclosed drum in a certified fabrication shop and deliver the drum to the Site in a preassembled unit ready to be erected.

2. Storage and Handling

Store all equipment and materials as recommended by the manufacturer. Ensure that the drum is handled in such a manner as not to damage or disturb the refractory system.

F. JOB CONDITIONS

1. Existing Conditions

The landfill is presently generating and naturally venting landfill gas. The startup of the system must be coordinated through the Engineer.

2. Environmental Requirements

The efficiency of the burner will be based on the ability of the equipment to continuously maintain the specified temperature and retention time requirements. Failure to meet these criteria will be considered to indicate failure to meet design and environmental requirements.

3. Protection

Ensure that the refractory materials are protected as per the manufacturer's recommendations and that the correct curing procedures are followed during initial startup and subsequent operation.

4. Sequencing and Scheduling

Coordinate the electrical and mechanical connections with the work of this Section.

1.02 PRODUCTS

A. GENERAL

Design the burner system to destroy 99 percent of total hydrocarbons in the collected landfill gas and capable of maintaining 875°C temperature and a minimum 3/4 second residence time at a landfill gas flow rate of 1200 SCFM.

A visible flame will not be permitted at design capacity.

Manufacturers tendering the supply of the burner system called for in these Specifications will be experienced in the design, construction and testing of such equipment and shall furnish evidence of having supplied and installed similar equipment that has been in successful operation. The burner system will be from HEETCO, JOHN ZINK COMPANY, PEABODY ENGINEERING, MCGILL or an approved equivalent manufacturer.

B. DESIGN SUMMARY

1. Interface

The foundation for the flare drum was prepared assuming a generic design for the stack. The parameters used are identified on the Drawings. Check to ensure that the foundation falls within the design limits identified and make all necessary changes to the foundation design as may be required. This redesign will be subject to the review of the Engineer and at no additional cost to the Region.

Provide the necessary drawings, details and materials for the anchorage system to meet the design criteria as outlined. Supply the anchor bolts and location drawings for installation by Division 3.

Provide for the erection and grouting of column baseplates to secure the flare drum, including all temporary support as may be required until final anchorage has been completed and it has attained its design strength.

2. Principal Characteristics

Design the burner to operate within the following parameters as measured at the inlet valve to the incinerator:

1.	Normal Flow Rate - Minimum	300 SCFM (8.5 m^3/m)
	- Maximum	1,200 SCFM (34 m^3/m)
2.	Normal Pressure	10 in W.C. (254 mm)
3.	Gas Composition	30% to 60% Methane 20% to 55% Carbon Dioxide 0% to 15% Nitrogen
4.	Ambient Temperature	-20 to 40°C
5.	Wind Speed	90 kmh
6.	Earthquake	Zone 1

C. DESIGN REQUIREMENTS

1. Flare Drum

Fabricate the flare drum of welded steel construction with internal supports for a refractory lining material. The refractory lining material shall be protected from deterioration due to operation and due to ambient conditions. All surfaces exposed to the flames shall be protected to a maximum temperature of 1200°C. The outside surface temperature of the flare drum shall not exceed 150°C. All steel surfaces of the flare drum shall be painted in accordance with the requirements under Section 09900, except that the flare shall receive two coats of heat resistant paint. The paint shall be Carbozinc 11 and Carbo Line 4631 as supplied by Corrosion Services Limited, Toronto.

All metals directly exposed to the high temperatures in the drum must be a suitable stainless steel alloy or adequately protected by the refractory system.

The flare drum shall be manufactured to stand alone and support gas burners and air controls.

The structural design checks for overturning shall assume that there is no contribution to the dead load by the refractory materials or miscellaneous hardware and piping.

Provide a personnel protective shield around the base of the flare drum to a height of two metres. The surface temperature of the shield is not to exceed 50°C.

2. Burners

Design the burners to maintain a constant flame and ensure complete combustion within the flare drum as determined by the operating conditions specified in this section.

Support the burner(s) from a gas distribution manifold designed to distribute the gas uniformly to the burners at equal volumes and pressures. Regulate the gas volume by modulation of an electrically operated control valve.

3. Air Control

Supply and install a combustion air bottom plenum complete with blade damper(s) and operator(s) to control combustion air. The motor operator(s) shall be controlled by a temperature controller which shall receive its signal from a ceramic sheathed-type K thermocouple located in the discharge gas stream.

4. Ignition System

Provide propane pilot designed to ignite the main flame. First lighting of the pilot shall be by electrical spark. Provide for shutdown of the propane pilot after a five minute time lag following confirmation of main flame.

5. Flame Monitoring

An ultraviolet and/or infra red flame monitoring system shall be supplied and installed for the verification of pilot ignition, main flame ignition and continuous operation.

6. Flame Arrestor

Supply and install a 200 mm area flame arrestor VAREC Model 53-81 or approved equivalent at the inlet to the burner manifold to arrest a flame from "flash back" toward the landfill gas system.

The core of the flame arrestor shall be stainless steel and removable for cleaning and replacement and have a bottom drain for the removal of accumulated moisture.

7. Access Hatch

Provide a bolted access hatch into the interior of the flare drum for inspection and maintenance. Ensure that refractory materials are adequately fastened and supported by the hatch cover to accept periodic removal for inspections.

8. Control/Shut Off Valve

Furnish a plug valve to control flow of the gas to the burner unit.

Furnish the valve with stainless steel bearings, corrosion resistant body and resilient plug facings for drip proof, gas tight shut off. Fit the valves top and bottom with grease fittings for bearing lubrication and a low friction packing. Bearing lubrication shall be suitable for the wet methane gas and cold weather application. Provide the valve with a bottom drain plug. The valve shall be as manufactured by DeZurick, Drum-Owen or an approved equivalent.

Control the valve by an electric actuator Model SMC-041 complete with a Modutronic 100 controller with a 4-20 milliamp output signal as manufactured by Limitorque Canada Ltd. or approval equivalent to function as indicated in Item 11 below.

9. Programmable Logic Controller (PLC)

Design and furnish a programmable control system to ensure safe reliable operation of the burner system. All functions of the burner, valve positioning, fan operation and total unit safety shall be provided by the logic of the program. The total control functions of the system are to be supervised by the PLC.

Furnish a detailed description of the logic of the program indicating the proposed operating sequence.

10. Temperature Controller

Furnish a programmable temperature controller and thermal sensor system unit to control the temperature in the burner unit. Locate the temperature sensor in the discharge air stream. The temperature controller shall function to change the position of the inlet air dampers on a temperature change.

11. Valve Controller

Furnish a digital controller to change the position of the control/shut off valve by the electric valve actuator. Provide a digital display indicating percent open of the valve. The valve should automatically power closed on system failure or shutdown.

12. Control Panel

Supply a prewired control panel to house the PLC, temperature controller and valve controller as specified. Locate the control panel in the electrical room illustrated on Drawings.

D. FACTORY TESTS AND INSPECTION

Provide a complete list of the equipment manufacturers and steel fabricators utilized. Arrange to permit shop inspections as requested by the Engineer.

1.03 EXECUTION

A. PREPARATION

Inspect the arrangement of the anchorage system and the general preparation of the site prior to confirming delivery schedule of the burner system.

B. INSPECTION

Notify the Engineer a minimum of two working days prior to the scheduled delivery of the burner system.

C. ERECTION

Provide temporary support for the flare stack as may be required until the anchorage system has been installed and inspected by the Engineer.

D. FIELD QUALITY CONTROL AND SYSTEM STARTUP REQUIREMENTS

Notify the Engineer prior to startup and testing of the various equipment and control systems associated with the burner. In the presence of the Engineer, demonstrate the operation of the propane, air control and valve control systems.

Notify the engineer a minimum of two working days prior to initial startup of the burner system to permit time to open and adjust the control valves for the individual gas wells in the landfill site.

Following initial startup of the burner system, provide the Engineer a minimum one week period of operation during which the system of gas wells will be balanced by the Engineer and Owner.

During the startup and balancing period, demonstrate that the various safety systems are functioning properly. The checks will including the following and all additional safety checks which the Engineer may reasonably request:

a) closure of the pneumatic valve on the main gas supply line following a system shutdown;

b) shutdown of the system following high temperature alarm condition;

c) shutdown of the system following loss of flame confirmation in the drum; and

d) proper operation of the remote alarm system.

E. COMMISSIONING AND TRIAL OPERATION TEST

Following successful demonstration and completion of the items described in clause 1.03D of this section, the following are the required steps in the commissioning process:

a) Notify the Engineer that the burner system is ready for the trial operation test.

b) Complete a full inspection of the burner system including the interior of the drum and condition of the refractory and other material.

c) Startup the system and bring the burner up to its design operating temperature. Place the burner system into automatic control and commence a continuous seven day trial period. Monitor the temperature readings during the test trial and provide a detailed written account of the equipment operation and observations. Should the trial be aborted as a result of an equipment malfunction, the problem will be corrected and the trial restarted from the beginning.

d) Following completion of the seven day trial, the burner system will be shutdown. After the drum has cooled, complete a full reinspection of the burner system and interior of the drum.

Following the successful completion and demonstration of the above to the satisfaction of the Engineer, the burner system will be considered substantially acceptable.

1.04 MEASUREMENT AND PAYMENT

Payment for the burner system will be made at the lump sum price stipulated in the Form of Tender for Item 9 which price and payment shall be full compensation for the design, supply and installation of the burner system and all other miscellaneous items for which separate payment is not provided under other Items.

DIVISION 15 - MECHANICAL

SECTION 15050 - PIPING

1.0 PIPING

1.01 GENERAL

A. DESCRIPTION

1. Work Included

Work of this Section consists of supply and installation of piping as specified and as shown on the Drawings. The work includes but is not necessarily limited to the following:

a) all schedule 40 steel piping,
b) copper piping for propane and pneumatic lines,
c) copper piping for water supply lines,
d) floor drain and cleanouts,
e) P.V.C. drain pipe, vent and connections,
f) fibreglass moisture separator.
g) emergency eyewash/shower station, and
h) washbasin.

2. Related Work Specified In Other Sections

The following items of work related to the work of this Section are specified in other Sections as noted:

1.	buried piping for header system and condensate drain line	Section 02700
2.	burner system	Section 13560
3.	electrical systems	Section 16000

3. Technical Requirements Specified In Other Sections

The following items of work shall be carried out in accordance with the technical requirements of the Sections noted below:

1.	metal fabrications	Section 05500
2.	painting	Section 09900

4. Terminology

Piping shall mean pipe, fittings and appurtenances.

B. REFERENCES

The publications listed below form part of this Specification. All piping will comply with applicable requirements of the latest editions of the following:

1. Canadian Standards Association (CSA):

2. American Society for Testing and Materials (ASTM):

3. ASME Boiler and Pressure Vessel Code:

C. QUALITY ASSURANCE

1. General

Piping shall be installed in accordance with ASME, Section 8 and 9.

2. Supplier-Installer Qualifications

Welding shall be performed by a fabricator fully approved by the Canadian Welding Bureau in accordance with CSA W47.

3. Testing

The Engineer reserves the right to have welding inspected by spot radiographic inspection. Pressure test all piping prior to placing in service at a minimum of twice the maximum operating pressure.

D. SUBMITTALS

1. General

Comply with Section 01030 Submittals. Submit shop drawings for all equipment in this section and include the necessary information in a detailed maintenance manual.

E. PRODUCT DELIVERY AND HANDLING

Deliver and store on the site all materials in a manner satisfactory to the Engineer. Inspect all materials jointly with the Engineer for damage in transit.

No defective material shall be delivered to the site and material found defective at any time shall be removed immediately and replaced at the Contractor's expense.

The Contractor shall be responsible for the proper on-site storage of equipment and shall ensure that the equipment is protected against damage to the satisfaction of the Engineer. All materials damaged while being stored on the site shall be replaced by the Contractor at the Contractor's expense.

F. JOB CONDITIONS

1. Environmental Requirements

Prior to undertaking any welding on Site refer to the health and safety provisions identified in Section 01100. Prime and protect all welding connections immediately following inspection as specified in Section 09900.

1.02 PRODUCTS

A. STEEL PIPE AND FITTINGS

1. Pipe

Pipe shall comply with ASTM A120 or ANSI B125.2 and the following:

a) Method of manufacture: Butt welded or seamless,

b) Weight: Schedule 40 unless indicated otherwise,

c) Finish: Black,

d) End finish: As required for the condition of the installation.

2. Fittings

Fittings shall comply with the following:

a) Flanged (125 lb standard)

b) Welded (Schedule 40 steel)

c) Threaded (steel pipe less than 50 mm Ø)

3. Flanges

Flanges shall comply with ANSI B16.5, 1035 KPA welding neck, slip-on and shall be flat-faced.

Flange bolts and nuts shall comply with ASTM A307, Grade B.

Flange gaskets shall be full-faced, 3 mm thick neoprene, as recommended by the flange manufacturer.

4. Weldolets

Provide weldolets at the sizes as shown on the drawings for the sampling and monitoring ports.

5. Thread Tape

Thread tape shall be teflon.

6. Protective Coating

Pipe and pipe fitting paint shall be as specified in Section 09900. Prime painting by this division. All final coats as per Section 09900.

B. COPPER PIPE AND FITTINGS

1. Pipe

Pipe shall be seamless copper tube complying with ASTM B 88 (ANSI H23.1) Type K, hard drawn for underground and Type L, hard drawn for aboveground.

2. Fittings

Wrought Copper and Bronze Solder-Joint Pressure Fittings: ANSI B16.22.

Cast Bronze Fittings for Flared Copper Tubes: ANSI B16.26.

3. Solder Metal

95-5 Tin Antimony, ASTM B 32, Grade 50A.

C. WALL SLEEVES

Provide Link Seal gasket for steel pipe entry into Condensate Chamber No. 1. Refer to specification in Section 02700.

D. HANGERS AND SUPPORTS

Provide pipe supports as detailed and shown on the Drawings. Provide miscellaneous brackets as required between building purlins.

E. FABRICATION

Butt welded steel piping shall be fabricated to field dimensions taken at the Site and not from the Drawings. Weld-neck flanges shall be used adjacent to forged fittings and insert type valves.

Forged fittings shall be used for all line sized laterals and tees. Coatings shall be applied after fabrication.

F. EXPANSION JOINT

Provide an expansion joint in the gas header pipeline as shown on the Drawings. The expansion joint shall be a single sphere connector Style 101 complete with flanged connections as manufactured by Flexonics Inc.

G. PVC Pipe and Fittings

Provide Schedule 80 PVC pipe and fittings for condensate drain connections to precast concrete chambers in accordance with Section 02700. Provide PVC DWV pipe and fittings for drain connections to plumbing fixtures and vent stack in accordance with CSA 181.2.

H. Emergency Shower/Eyewash Station

Emergency shower/eyewash station shall be equipped with drench shower, eye bath, deluge shower head, stainless steel bowl and shall be stay-open ball valve Model 8301 as manufactured by Haws Emergency equipment, or an approved equivalent.

I. Washbasin

Washbasin shall be vitreous china laboratory wall hung type I-70 Model Closin as manufactured by Crane Ltd. or approved equivalent. Washbasin shall be equipped with citadel single lavatory faucet Model C-1054 as manufactured by Crane Ltd. or approved equivalent.

J. Floor Drain

Floor drain shall be Ancon Series FD-100, cast iron body with bronze strainer and flange. Floor drain shall be installed with PVC P-trap.

K. Pipe Insulation

Insulate the copper propane pilot supply lines continuously from the storage tanks to the termination at the propane pilot with 50 mm preformed sectional glass fibre insulation complete with metal foil membrane jacketing suitable for outdoor installation.

Insulate the P.V.C. condensate drain lines from the main gas header to the condensate trap in the two respective precast concrete chambers with insulation similar to the above.

L. Moisture Separator

Provide a custom manufactured fibreglass reinforced plastic moisture separator complete with a galvanized steel support stand as shown on the Drawings. Equip the separator complete with the flanges, drain and access hatch as shown. The separator will be designed to operate under a maximum vacuum of 15 KPa.

1.03 EXECUTION

A. PREPARATION

Notify the Engineer a minimum of two working days prior to the scheduled connection of the steel piping to the buried pipeline from the landfill.

B. INSPECTION

Inspect the buried pipe flanges in Condensate Chamber No. 1 prior to connection of the pipeline. Ensure that pipe supports are adequate for the additional load from the steel pipe. Provide additional supports as required.

C. INSTALLATION

1. General

Installations shall be completed to present a neat orderly appearance.

Openings or passageways shall not be blocked with piping. Minimum clear headroom shall be 2000 mm.

Piping shall be run parallel to building walls.

Steel piping shall be kept free from contact with structure or installed items except as noted on the drawings.

Clearances shall be allowed for expansion and contraction of pipe.

Horizontal runs over 15 m shall be anchored at the locations as shown on the drawings.

Vertical piping shall be placed as follows:

1. secure at sufficiently close intervals to keep pipe in alignment and to support weight of pipe and contents.

2. install supports vertically at intervals of not more than 3 m.

3. if piping is to stand free of support, or if no structural element is available for support during construction, secure in position with wooden stakes or braces fastened to pipe.

Horizontal piping shall be placed as follows:

1. support at sufficiently close intervals to maintain alignment and prevent sagging.

2. install hangers at ends of runs or branches and at each change of direction or alignment.

3. support spacing shall not exceed the manufacturer's recommendations, nor as specified below:

Pipe	Maximum Support Spacing (metres)
Steel	
Under 75 mm	2.5
75 mm and over	5.0

Pipe	Maximum Support Spacing (metres)
Stainless Steel and Copper	
Under 40 mm	1.8
40 mm to 100 mm	3.0
Over 100 mm	5.0
PVC	
Under 60 mm	1.2
60 mm and over	1.8

Do not use equipment to support piping or induce strain on equipment during or subsequent to the installation of piping.

Provide flexible connections or unions shall be provided at all connections to equipment to facilitate removal for maintenance.

2. Wall Sleeves and Spools

Install wall sleeves as per manufacturer's directions and as outlined in Section 02700.

3. Bell and Spigot, Push-On, and Mechanical Joint

Push-on joints shall be made in accordance with the manufacturer's instructions.

Mechanical joint installation shall comply with manufacturer's instructions.

4. Flanged Joints

Flange bolts shall be tightened so that gasket is uniformly compressed and sealed.

Flanges shall not be distorted.

Flange bolts shall be left with ends projecting not more than 12 mm nor less than 6 mm and no bolt shall be less than the diameter of the hole in which it fits by more than 3 mm.

5. Welded Joints

Welded joints shall be shop fabricated to the maximum extent possible.

Field welding shall be performed by certified welders.

Damage to protective coatings shall be repaired to a condition equivalent to the factory or shop applied coating.

6. Copper Pipe

Pipe shall be bent by any method and to any radius within manufacturer's recommendation and in a manner to ensure surfaces are free of cracks and buckles.

Joints shall be soldered as follows:

1. Ream or file pipe to remove burrs.
2. Clean and polish contact surfaces of joint.
3. Apply flux to both male and female ends.
4. Insert end of tube into fittings full depth of socket.
5. Bring joint to soldering temperature in as short a time as possible.
6. Form continuous solder bead around entire circumference of joint.

All connections between copper and ferrous materials shall be dielectric unions.

D. FIELD QUALITY CONTROL

1. General

All pipe and fittings shall be pressure tested as specified herein.

The Contractor shall furnish all material, equipment and labour for testing and retesting the piping system.

Each system may be tested as a unit or in sections but each complete system shall successfully meet the requirements specified herein. Should any defects appear in the pipe or fittings, the necessary repair shall be made, and the line retested until it meets the requirements.

Contractor shall take all necessary precautions to prevent any joints from drawing while the pipelines and their appurtenances are being tested. The Contractor shall, at its expense, repair any damage to the pipes, fittings and their appurtenances or to any other structures resulting from or caused by these tests.

E. ADJUSTMENT AND CLEANING

Ensure that the pipeline is thoroughly cleaned prior to final assembly.

1.04 MEASUREMENT AND PAYMENT

Payment for piping will be made at the lump sum price stipulated in the Form of Tender for Item 10 which price and payment shall be full compensation for supply and installation of piping; fittings; fixtures; testing; and all other miscellaneous items for which separate payment is not provided under other Items.

Payment for buried piping for gas header, drain lines and water supply line will be included under payment items of Section 02700.

SECTION 15100 - VALVES

1.0 VALVES

1.01 GENERAL

A. DESCRIPTION

1. Work Included

Work of this Section consists of supply and installation of valves. The work includes but is not necessarily limited to the following:

a) supply and installation of 315 mm Ø pneumatically operated plug valve;

b) supply and installation of 100 mm Ø lever operated plug valves;

c) supply and installation of gauge valves and gauges;

d) supply and installation of gate valves;

e) supply and installation of solenoid valve;

f) supply and installation of P.V.C. ball valves; and,

g) supply and installation of regulators.

2. Related Work Specified In Other Sections

The following items of work related to the work of this Section are specified in other Sections as noted:

1. valves for gas sub-header system - Section 02700

2. solenoid valve connections - Section 16000

3. Technical Requirements Specified In Other Sections

The following items of work shall be carried out in accordance with the technical requirements of the Sections noted below:

1. Pipe Connections - Section 15050

B. REFERENCES

The publications listed below form part of this Specification. All valves and equipment will comply with applicable requirements of the latest editions of the following:

1. Canadian Standards Association (CSA):

2. Canadian Gas Association (CGA):

3. American National Standards Institute (ANSI):

4. American Society for Testing and Materials (ASTM):

C. QUALITY ASSURANCE

1. General

All valves of the same type shall be by a single manufacturer.

Where specified, valves and operators shall conform to all applicable CGA and ANSI standards.

D. SUBMITTALS

1. General

Comply with Section 01030 Submittals. Submit shop drawings for all equipment supplied by Section 15100 and include the information in the maintenance manual.

E. PRODUCT DELIVERY AND HANDLING

1. Delivery

Valve ends shall be sealed to prevent entry of foreign matter into valve body.

Valves, operators and accessories shall be boxed, crated and completely enclosed and protected from accumulation of foreign matter.

2. Storage and Handling

Valves, operators and accessories shall be stored in an area protected from weather, moisture, or possible damage. Material shall not be stored directly on the ground. Valves shall be handled with care to prevent interior or exterior damage.

F. JOB CONDITIONS

1. Environmental Requirements

Abide by the health and safety provisions indicated in Section 01100. The landfill gas is a potentially explosive and corrosive gas. All valves must be left in a closed position following installation.

3. Protection

Valves must be protected against any damage to the interior finish of the valves. Damage to its interior finish of the valves must be restored to new condition and approved by the Engineer prior to installation.

4. Sequencing and Scheduling

Install valves, where practical, such that a minimum number of spool pipes are required to construct the pipelines.

1.02 PRODUCTS

A. GENERAL

Supply valves to meet or exceed the standards implied by the subsequently First Named Selections.

B. MATERIALS

1. Plug Valves

Valves shall be Dezurik Series 100 Eccentric Plug valves or Keystone Figure 2132 Ballcentric plug valves for the blower control valves and the pneumatically operated valve on the main gas supply line. Supply the valves complete with cast iron body, top and bottom grease fittings, stainless steel bolting, interior and exterior epoxy coating and a Ni-Resist Plug with a Buna N resilient plug facing.

2. Manual Operators

Supply lever operators for 100 Ø blower control valves with an infinite position locking handle.

3. Pneumatic Operator

Equip the main plant shutoff valve with pneumatic valve operator complete with a double acting cylinder designed to operate at 5500 kPa (80 psi), rack and gear drive.

4. Solenoid Valve

Provide an electric, single, direct-acting, four-way, solenoid valve complete with brass body, explosion-proof as manufactured by Ascolectric Limited Model 8342 A2 or an approved equivalent.

5. P.V.C. Ball Valve

Provide Fabco Model 319090 true union ball valves with socket ends for the condensate drain lines as indicated on the drawings.

6. Vacuum Gauges

Provide vacuum gauges for the landfill gas header having a range from 0-40 inches water column (0-10 kPa) vacuum complete with aluminum case, 6 mm (1/4 inch) NPT connection and equipped with a gauge valve to isolate the gauge.

7. Pressure Gauges

Provide pressure gauges for the landfill gas header having a range from 0-60 inches water column (0-15 kPa) complete with aluminum case, 6 mm (1/4 inch) NPT connection and equipped with a gauge valve to isolate the gauge.

Provide cylinder pressure gauges for the propane tanks.

8. Automatic Changeover Regulator - Nitrogen System

Provide an automatic changeover regulator Rego, Model M2523 HP series complete with cylinder pressure gauges and back pressure check valve. Fabricate a mounting bracket as required to accommodate connection to the gas cylinders.

9. Automatic Changeover Regulator - Propane System

Provide Commercial Automatic Changeover Regulator Fisher Type 64SR/122 to control the propane gas pressure outlet at 10 psi.

10. Nitrogen System Shutoff Valves

Provide Dezurik Series 100 stainless steel plug valves with teflon packing or an approved equivalent.

11. Propane System Shutoff Valves

Provide Dezurik Series 100 stainless steel plug valves with teflon packing or an approved equivalent.

12. Water Supply Gate Valves

Provide Jenkins Figure 313 bronze body gate valve with soldered ends or an approved equivalent.

1.03 EXECUTION

A. INSPECTION

Notify the Engineer a minimum of 48 hours prior to the installation of control valves on the main header lines to permit final inspection of the pipelines.

B. INSTALLATION

1. General

All valves and accessories shall be installed by the Contractor in a manner and location as shown on the Drawings or as required for the application and in accordance with manufacturer's instructions. Size of valve shall be equal to line piping in which valve is installed unless otherwise noted on the Drawings. All valves shall be supported where necessary. In case of conflict between these Specifications and a governing code, the higher standard shall prevail.

2. Accessories

Provide suitable floor stands with operators at approximately thirty 750 mm height where required for proper valve support and operation.

3. Valve Operators

Valves shall be installed with the operator in a position for convenient operation. Particular care shall be taken to ensure that space is available for operation of lever or handwheel operated valves without interference from walls, piping or equipment. Operators for manual valves shall be lever or handwheel as is standard with the manufacturer unless another type of operator is specified or required by the manufacturer.

4. Valve Identification

Provide plug valves with numbered brass discs attached to valve by brass chain. Provide valve chart indicating valve tag number, location of valve, service, and normal position of valve.

Fully identify all valves by the manufacturer including size, manufacturer's name, and pressure rating.

D. FIELD QUALITY CONTROL

Testing shall be performed with the piping system that the valve forms part of.

E. ADJUSTMENT AND CLEANING

Check and adjust valves and accessories for smooth operation. Lubricate in accordance with manufacturer's recommendations.

1.04 MEASUREMENT AND PAYMENT

Payment for valves will be made at the lump sum price stipulated in the Form of Tender for Item 10 which price and payment shall be full compensation for supply and installation of valves; supply and installation of pressure and vacuum gauges; supply and installation of valve operators; supply and installation of valve stems and boxes; supply and installation of regulators; and all other miscellaneous items for which separate payment is not provided under other Items.

SECTION 15821 - BLOWERS

1.0 BLOWERS

1.01 GENERAL

A. DESCRIPTION

1. Work Included

Work of this Section consists of supply and installation of blowers as specified and as shown on the Drawings. The work will include, but is not necessarily limited to the following:

a) supply and install two gas blowers

b) supply and install vibration couplings

2. Related Work Specified In Other Sections

The following items of work related to the work of this Section are specified in other Sections as noted:

1. electrical connections - Section 16000

3. Technical Requirements Specified In Other Sections

The following items of work shall be carried out in accordance with the technical requirements of the Sections noted below:

1. grouting - Section 03000

2. painting - Section 09900

B. REFERENCES

The publications listed below form part of this Specification to the extent specified in this Section:

1. Canadian Standards Association (CSA):

C. QUALITY ASSURANCE

1. Testing

Notify the Engineer with a minimum 48 hours notice prior to the quality control testing of the blowers at the manufacturer's facility. Provide the Engineer copies of the test results. Following completion of the field installation, the manufacturer shall perform an identical quality control test and provide results to the Engineer. The vibration must not exceed the recommendations for maximum allowable as determined by the manufacturer.

D. SUBMITTALS

1. General

The Contractor shall comply with Section 01030 Submittals

2. Shop Drawings

Submit shop and erection drawings of all equipment.

3. Operations and Maintenance Manuals

Submit detail procedures and information as outlined in Section 01030 and incorporate the information into the maintenance manual for Division 15.

E. PRODUCT DELIVERY AND HANDLING

1. Delivery

Ensure that the blower support frame is provided with lifting holes or brackets and is adequately braced to ensure that the site installation does not damage or unbalance the equipment alignment.

2. Storage and Handling

Ensure that the handling of the blowers conforms to the manufacturer's recommendations. Upon delivery, the blowers should be immediately placed in their final location. Anchor and grout the frames as recommended by the manufacturer.

F. JOB CONDITIONS

1. Sequencing and Scheduling

Coordinate the work of this Section with concrete work specified in Section 03000 to ensure the correct location of the housekeeping pads. Schedule the timely delivery of anchor bolts to the Site to ensure their proper embedment in concrete.

1.02 PRODUCTS

A. MATERIALS

1. Blowers

Blowers to be Canadian Blowers/Canada Pumps Model 3RE centrifugal fan (or an approved equivalent) complete with fibreglass housing, aluminum wheel (21.5 inch diameter), and equipped with a motor slide base mounted on a common channel frame, V-belt assembly and belt guards. Blowers shall be completely sealed against leakage.

The blowers shall be capable of handling gas which will be 30 to 60 percent methane (CH_4), 20 to 55 percent carbon dioxide (CO_2) and 10 to 15 percent nitrogen (N_2). Blowers shall be rated for 300 L/s of this gas at a suction pressure of 5 kPa W.G. and a total pressure of 8 kPa W.G.

Provide transitions and adaptors for both the suction and discharge to suit flanged piping system. Vibration isolation shall be provided to blower inlet and outlet. Provide anchor bolts to rigidly fix the blower frame to the concrete housekeeping pad.

2. Expansion Joints

Provide single sphere style 101 expansion joints complete with flanged connections as manufactured by Flexonics Inc. or an approved equivalent on fan inlet and outlet.

3. Motors

Motors shall be sized to meet the power requirements of the blower at the specified operating conditions. Motors shall be fitted for suitable belt drive complete with belt guard. Motor shall be explosion proof, 7.5 HP, 575V, 3 phase and 60 Hz.

4. Pedestal

Blower and motor shall be mounted on a single steel pedestal of rigid construction. Motor shall be mounted on the pedestal with provision for positive adjustment for proper belt tension with no distortion. Pedestal shall be fitted for anchor bolts, to be provided by blower manufacturer. Bolts to be supplied in good time for setting in concrete base.

B. FABRICATION

The pedestal, motor and all related appurtenances shall be shop-coated in accordance with Section 09900.

1.03 EXECUTION

A. PREPARATION

Ensure that anchorage system has been properly installed and fully set prior to prior to installation of blowers.

B. INSPECTION

Notify the Engineer with 48 hours notice prior to commencing field installation.

C. INSTALLATION

Equipment shall be installed by qualified mechanics, approved by the equipment manufacturer.

The equipment shall be assembled and installed in strict conformity with procedures outlined by the manufacturer.

Electrical conduit, wiring, switches, and starter for the blower will be provided and installed by Division 16.

Provide all suitable and necessary means of equipment handling which will enable proper and safe installation of this equipment.

Installation of equipment shall be in accordance with approved manufacturer's Working Drawings, the Specifications and the Contract Drawings.

The Pedestal shall be shimmed and bolted into place as required to provide a proper fit between the blower and the connecting piping, so that no stress or strain is created in the pipes, the blower or the associated equipment, due to forcing parts into position. The pedestal shall be grouted solidly to the concrete base in accordance with Section 03000. Lock nuts shall be provided on the anchor bolts.

On completion of the installation and prior to startup, the blower, motor, belt drive and accessories shall be thoroughly inspected and cleaned of debris and foreign materials.

D. FIELD QUALITY CONTROL

After the installation of the equipment has been completed and the units have been in service for not less than 100 running hours each, a field test shall be conducted by the Contractor in the presence of the Engineer to confirm the performance of the units under actual operating conditions. Supply labour and whatever measuring instruments properly calibrated that may be required.

Perform any adjustments or repairs arising from faulty installation of the blowers or motors which are found to be required during the performance of the tests.

E. ADJUSTMENT AND CLEANING

The installation of the blower must provide an airtight seal whether the equipment is on line or not. Ensure that all gaskets and seals are seated properly and that there is no detectable evidence of methane gas at any of the mechanical connections to the blower or blower housing.

1.04 MEASUREMENT AND PAYMENT

Payment for blowers will be made at the lump sum price stipulated in the Form of Tender for Item 10 which price and payment shall be full compensation for supply and installation of blowers; supply and installation of vibration couplings; and all other miscellaneous items for which separate payment is not provided under other Items.

SECTION 15829 - VENTILATION SYSTEM

1.0 VENTILATION SYSTEM

1.01 GENERAL

A. DESCRIPTION

1. Work Included

Work of this Section consists of supply and installation of the ventilation systems as specified and as shown on the Drawings. The work will include but is not necessarily limited to the following:

a) dampers and explosion-proof motors and housing;

b) roof exhaust fan

c) wall mounted fan

2. Work Not Included

The following items of work associated with the work of this Section do not form part of this Specification:

1. Electrical wiring and conduit - Section 16000

3. Related Work Specified in Other Sections

The following items of work related to the work of this Section are specified in other Sections as noted:

1. Electrical - Section 16000

2. Pre-engineered Buildings - Section 13121

B. QUALITY ASSURANCE

1. General

All work must conform to all codes, by-laws, Provincial and Municipal Authorities having jurisdiction.

Where the work as shown exceeds the minimum requirements of such regulations, the Drawings and Specifications shall govern.

Provide all necessary permits, inspections, and certificates as may be required.

C. SUBMITTALS

1. General

The Contractor shall comply with Section 01030 Submittals.

2. Shop Drawings

Submit shop and installation drawings.

3. Operating and Maintenance Manual

Submit detailed information as outlined in Section 01300 and incorporate the information into the maintenance manual.

1.02 PRODUCTS

A. MATERIALS

1. Blower Room Exhaust Fan - EF1

The fan room roof exhaust will be a 300 mm Model 309 roof exhauster as manufactured by Delhi Industries or an approved equivalent. The fan is complete with a galvanized cabinet and cowl with green enamel finish, an automatic back draft damper and bird screen, roof curb and an explosion-proof motor (1725 rpm, 1/4 HP, single phase, 115 volt).

2. Electrical Room Exhaust Fan-EF2

The electrical room fan will be a Model 10 DW8X direct drive fan as manufactured by Hart & Cooley or an approved equivalent. The fan is complete with a Model LWL12 Gravity damper, wire guard, 1/15 HP, 1150, 1050 rpm motor.

3. Louvers and Dampers

Stationary louvers shall be extruded aluminum alloy of welded steel construction, c/w stormproof blade, stainless steel fasteners and bird screen. The louvers shall be E&R Products Model EAL-2F or approved equal. Electric motorized dampers shall be 110V, single phase, 60 Hz, operation where shown on the drawings. Dampers shall be parallel blade low leakage, spring return and shall be of sparkproof construction. Damper motors shall be Honeywell Model M44SA. In the blower room the motor shall be enclosed in a Crouse Hinds Model XJB 8158 explosion proof housing with explosion proof connection.

1.03 EXECUTION

A. INSTALLATION

Equipment must be installed by qualified mechanics. The equipment shall be installed in strict conformity with the manufacture's recommendations.

Ensure that a watertight seal is provided at all penetrations through the roof and walls as required for this equipment.

Electrical conduit, wiring, switches, and thermostats will be provided and installed by Division 16.

1.04 MEASUREMENT AND PAYMENT

Payment for the ventilation system will be made at the lump sum price stipulated in the Form of Tender for Item 10 which price and payment shall be full compensation for supply and installation of room exhaust fans; supply and installation of motorized air dampers and housings; and all other miscellaneous items for which separate payment is not provided under other Items.

DIVISION 16 - ELECTRICAL

SECTION 16000 - ELECTRICAL

1.0 ELECTRICAL

1.01 GENERAL

A. DESCRIPTION

1. Work Included

Work of this Section consists of supply and installation of electrical as specified and as shown on the Drawings.

The work includes, but is not necessarily limited to the following:

1. supply, installation and modification of main service, overhead and underground electrical power service including step down transformer;
2. supply and installation of main control panel;
3. supply and installation of lighting and heating systems;
4. supply and installation of a methane gas detection system;
5. supply and installation of a remote alarm system and coordination with existing alarm system;
6. supply and installation of all wiring and conduit for all blower, fan and damper motors;
7. supply and installation of wiring and conduit to nitrogen system solenoid valve;
8. supply and installation of emergency shutdown station; and
9. supply and installation of wiring and conduit to the burner control panel and associated electrical devices.
10. Supply and installation of two telephone lines, one for voice and one for connection to the Bristol System at 700 Woodward Avenue.

2. Work Not Included

The following items of work associated with the work of this Section do not form part of this Specification:

1. burner system control panel - Section 13560

3. Related Work Specified in Other Sections

The following items of work related to the work of this Section are specified in other Sections as noted:

1. burner system - Section 13560
2. concrete encasement - Section 03000

B. REFERENCES

The publications listed below form part of this Specification to the extent specified in this Section:

1. Canadian Standards Association (CSA):
2. Canadian Electrical Code (CEC):
3. Electrical and Electronics Manufacturers Association of Canada (EEMAC):
4. Instrument Society of America (ISA):
5. Factory Mutual (FM):

C. QUALITY ASSURANCE

1. General

The whole of the work as covered by these Specifications and their associated drawings shall comply with the latest rules and regulations of the Canadian Electrical Code, or any other body having jurisdiction. These rules are an integral part of the Specifications. Do not diverge from the letter of intent of the drawings or Specifications without obtaining permission prior to execution of such changes.

2. Supplier-Installer Qualifications

Work shall be executed in a neat, first class workmanship manner by qualified tradesmen.

For work involving switchgear, instrumentation, pole line, and motor controls employ tradesmen thoroughly qualified and experienced in such work.

3. Testing and Inspections

Obtain necessary permits, licenses, notices, certificates of inspection and approvals and pay required fees. Provide copies of all certificates and inspection reports to the Engineer.

D. SUBMITTALS

1. General

Comply with Section 01030 Submittals.

2. Shop Drawings

Submit to the Engineer, shop drawings of the equipment supplied under these sections. The Engineer's review shall be for the general design only and shall not in any way relieve the Contractor from responsibility for the proper completion of the work in accordance with the true intent of the Contract Drawings and Specifications. Non-standard drawings showing elevations, footings layouts, or electrical and piping connections shall be provided as reproduceable.

3. Operating and Maintenance Manuals

Provide to the Engineer four copies of all operating and maintenance instructions for all major items of equipment and all electrical systems and include in a detailed operating and maintenance manual.

4. Record Drawings

Obtain four sets of white prints and mark with all changes and deviations from the Contract Drawings. The changes shall be recorded as they are made so that a full record of the work is kept as the work progresses. Failure to keep drawings up to date will be considered a deficiency and payment withheld.

The Engineer or his authorized representative shall have access to these Drawings at all times during the progress of the work. On completion of the job, Drawings shall be turned over to the Engineer.

E. PRODUCT DELIVERY AND HANDLING

1. Storage and Handling

Store packaged materials in original undamaged condition with manufacturer's labels and seals intact.

Prevent damage to material during handling and storage.

F. JOB CONDITIONS

1. Existing Conditions

Confirm the loads of the existing leachate system pumps fed from the main service.

Before submission of tender, visit and examine the site. No allowance will be made for the failure to do so.

2. Environmental Requirements

Some areas are classified as hazardous. All equipment shall be rated to meet the classifications. The blower room is rated as Class 1 Group D Division 2.

3. Sequencing and Scheduling

Coordinate the connection of equipment supplied by others with the appropriate supplier or Contractor.

1.02 PRODUCTS

A. GENERAL

Material supplied under these sections shall be new and conform to the standards of EEMAC and CSA. In the event that the materials specified do not bear the appropriate approvals the Contractor shall obtain the necessary approval and pay for all charges levied by them and make good any modifications required.

Where references are made to, or equipment specified falls under the category of Standard Specifications such as EEMAC, CSA, FM etc., the latest edition and revisions of such standard specifications shall apply.

It is the responsibility of the Contractor to size the wire, conduit, service, and distribution to suit the equipment and the area where it is located whether supplied by the Contractor or others.

Provide the Engineer with two copies of a list of all lamps used throughout the project, indicating wattage, voltage, ordering abbreviation and/or catalogue number and location.

All equipment supplied under this contract shall be factory painted with at least two coats of paint suitable for the environment where the equipment is situated and to the Owner's approval.

B. ELECTRICAL DISTRIBUTION SYSTEM

1. Conduit

Wire and cable shall be installed in conduit unless otherwise noted on the Drawings. The conduit shall be rigid galvanized steel with threaded IPS fittings throughout except in hazardous areas where termination fittings shall be approved for the class location. The minimum size of conduit shall be 20 mm. Aluminum conduit shall not be used. An extra wire to act as a pull wire is to be in each conduit run for future use. Underground conduit runs may be rigid PVC if area classification permits its use.

2. Outlet, Pull and Junction Boxes

Suitable steel, PVC or cast boxes shall be used for all taps and junctions on all conduit work. Pull boxes shall be installed where necessary to permit easy insertion and withdrawal of conductors. Pull boxes, outlet boxes, control panels, and other cabinets shall be supported independently of the conduit. All shall be installed so as to be accessible after the project is complete.

Pull boxes and junction boxes shall be of steel, PVC or cast construction with a minimum of EEMAC 4 rating. The boxes shall be of sufficient size to take the conduits entering them and the conductors and connections thereto. All boxes shall be galvanized or have a rust resistent finish. All boxes used in areas that are designated as hazardous shall have threaded conduit fittings and seals that are approved for use in the area they are used. All connections to equipment which is subject to movement or vibration shall be with flexible fittings of the explosion proof type where required.

An adequate length of wire for making connections shall be left at junction boxes from which future extensions are to be made.

3. Wire and Cable

Building wire and cable shall be of copper and types and sizes noted on Drawings, rated at 600 volts and approved for the application.

Wire and cables unless otherwise noted on Drawings, shall be type RWU90 or TWHU75 for dry and wet locations. Home runs to panel boards shall be #10 if more than 15 metres. Wiring on and around flame shall be Raychem 165°C or equal.

Minimum wire size shall be #12 B & S gauge unless specified otherwise. Colour coding by CSA C22.2 Rule 4-042.

The number of wires indicated is intended to show the general scheme only. The required number and type of wires shall be installed with the equipment manufacturers diagrams and requirements, and with the requirements of the installation.

Branch circuit connections requiring terminals shall be made with a pressure connector applied with a pressure tool manufactured by Burndy, Stakon or equal.

Instrumentation signal wiring shall be shielded twisted pair Dekron or equal minimum of #18 AWG. The color code shall be white and black. Instrumentation multiconductor cable shall be as specified by the manufacturer of the instrument and suited for the area where it is installed.

Feeder cable connections shall be made with solderless type lugs having sufficient contact area and large enough screw to apply proper pressure for the feeder cables used.

The pole line from the main service box shall consist of a three conductor neutral supported cable NSF-2 supported by poles at a maximum spacing of 60 metres or as required by the local authority.

An alternate price for underground cable from the service to the plant compound shall be offered in the Schedule of Provisional Quantities and Prices (Item 2). The cable used shall be a TECK 90.

4. Grounding

Provide a grounding system in strict accordance with local regulations and to the satisfaction of the electrical inspector. The grounding system in general will incorporate the following:

a) Transformer secondary neutrals shall be grounded effectively.

b) The entire conduit system shall be grounded solidly and grounding jumpers shall be used whenever the grounding continuity is in doubt; and all conduits will be grounded at both the supply and road side. Exposed metal parts, non-current carrying equipment and equipment cases, frames etc. shall be grounded.

c) The ground connector in each blower junction box and the main and burner panels shall be connected to the ground grid.

d) The installation upon completion, shall be checked with an appropriate megger. The grounding resistance reading shall meet the Canadian Electrical Code requirements.

e) The flare stack shall be grounded at four points for protection from lightning. An insulated ground cable shall be run to the main ground rods to provide a commonality of ground points. The resistance shall meet the code requirements.

5. Lightning Protection

The Contractor shall supply and install low voltage lightning arrestors on overhead feeders and branch circuits in order to completely ensure the electrical installation against any lightning surges. The arrestors shall be GE #9115BCA008 or approved equal.

6. Devices and Cover Plates

All switches and receptacles shall be surface mounted and suitable for the area where they are mounted. In areas that are non-hazardous PS type conduit fittings with galvanized steel face plates shall be used. Devices shall be:

Single Pole	Hubbell #1201 or 1221
Three Way	Hubbell #1203 or 1223
Pilot SW Combo	Hubbell #1277 or 1297

Nominal mounting heights of outlets (center line of outlet from top of finished floor) shall generally be as follows except as noted on the Drawings.

Lighting Switches - 1.35 m
Receptacles - 0.30 m
Thermostats - 1.50 m

7. Distribution Transformer

The distribution transformer is to be an indoor dry type with ventilated enclosure. The insulation shall be Class C up to 15KV and Class H for 30KV and higher. The transformer shall be 600 VAC 600 / 120-208.

C. CONTROL PANELS

1. Wiring

The wire used in the assembly of the control panel shall meet with the requirements as specified by CSA. The minimum wire size for control circuits shall be #14 and shall be TEW. The wire color code shall be as follows:

120 VAC control circuits - RED
Low voltage control circuits - BROWN
DC control wiring - BLUE
120 VAC power wiring - BLACK
Ground Wiring - GREEN

All wiring is to be run in suitable wiring duct white in color such as Panduit.

2. Terminals

No more than two wires may be connected in one termination point. Jumper straps may be used for terminal blocks provided they are manufactured by the manufacturer of the terminal blocks and approved for that usage. The terminals used shall be Wiedmueller SAK 4 or equivalent.

3. Enclosure

The enclosure is to be EEMAC 12 finished with a high quality rust resistent paint such as polyurethane ASA61 Gray. The construction of the control panel is as shown on the Drawings.

4. Grounding

The control panel shall be equipped with a ground lug suitable for a #2 ground wire. The internal grounding of the control panel shall be to the latest CSA requirements.

5. Circuit Breakers

The circuit breakers used for 120 VAC control and power are to be Square D QOU 115 or QOU 215 mounted on the control panel subplate.

D. HEATERS AND THERMOSTATS

Provide three Chromalox air heaters to keep the blower and electrical room at a temperature of 16 degrees. Two Type CEP-30-C 3000 Watt explosion proof heaters for the blower room and one DC18015 1500 watt convection heater for the electrical room. The blower room heaters will have explosion proof thermostats Chromalox AR0464EP1. The electrical room will have a Chromalox DCTH13 thermostat mounted on the heater.

E. MOTORS AND STARTERS

Blower motors, ventilation fans and damper motors will be supplied by the Mechanical Contractor unless otherwise noted. The motors will be set and aligned by the mechanical contractor. Local disconnects will be required to suit the code requirements. The motors, conduit, and devices shall suit the area class where they are mounted.

The Contractor shall size the overload elements using the motor nameplate full load current. The Contractor shall verify the correct rotation of the motor and correct if necessary.

The starters of the motors are to be in the main control panel. The starters shall be Full Voltage Non-Reversing with 120VAC control power. The starter shall have auxiliary as shown on the Drawings. Each starter overload shall have overload alarm contacts. Each motor will have its own circuit breaker for overcurrent protection. The size of the circuit breaker is to be based on the motor full load current. The disconnect at each blower motor shall be Allen Bradley 609 BEW in explosion proof enclosures.

F. TELEPHONE SERVICES

The telephone alarm interface shall consist of a modem connected to the control device. The system shall operate as polled device from the existing Bristol network via standard telephone lines. The Contractor shall be responsible for the coordination of the alarm status display with the authority engineering staff and with engineers from either Bristol or engineers authorized to have access to the system. The Contractor shall include any costs for the engineering.

The Contractor shall provide a wall mounted telephone for future maintenance staff in the electrical room.

The Contractor shall provide 120 V intruder alarm door switches wired to the input on the Controller. The alarms are to indicate unauthorized entrance of the building in the main Bristol System.

The Contractor shall provide a Bristol 3330 Controller with a modem capable of interfacing to the existing Bristol System via a telephone line.

G. COMBUSTIBLE GAS DETECTION SYSTEM

The combustible gas detection system is required to sense the existence of methane gas in either the blower room or the electrical room. The electronics for the system will be wall mounted in the electrical room. The system is to have two detection heads one mounted in the electrical room and one mounted in the blower room above the blowers. The detector is to have two alarm relays. The first level of alarm is set at 20% CH4 and is used to start up the ventilation fans as well as giving an alarm signal to the alarm system. The second alarm point is to be set at 40% CH4 and is used to shut down the burner system, bring on the outside alarm light, and give an alarm to the alarm system. The acceptable systems are Armstrong ACM-1012 and MSA 511DH.

H. LIGHTING SYSTEM

The blower room is rated a Class 1 Division 2 Group D hazardous area.

The exterior warning light shall be an Appleton AEP 1060 with red lens or an approved equivalent.

The interior switches are to be three way Appleton EFD 150-F3W-FS rated at 20 amps. The blower room fixtures are to be Appleton AEP 1050 or an approved equivalent.

The light fixture for the electrical room is to be RAB VAS-100 or an approved equivalent.

I. EMERGENCY SHUTDOWN STATION

The emergency shutdown station shall be mounted at the compound gate. The station shall consist of a Square D 9001 SKY1 enclosure with a 9001 KR1u pushbotton, watertight boot and KA1 contact block. The restraining device shall be a 9001 K15 with 5 spare glass disks 9001 K57. The station shall have a rain shield and warning nameplate.

1.03 EXECUTION

A. COOPERATION

Equipment installed without regard to this Section, if found to interfere with either the function or appearance of the other systems, structure, or finishes, shall be relocated as directed by the Engineer and without charge to the Owner.

B. SERVICE CONNECTION

Provide connection to the existing service with main and branch breakers to suit new and existing requirements. The modification to the existing service shall meet the requirements of the local public utility. The existing service has a 200 amp main switch fused at 125 amps.

The Contractor shall also allow in his price for metering and service charges as required.

C. INSTALLATION

1. General

The approximate locations of equipment, switches, panels etc. are given on the Drawings. In the absence of definite detail the exact location of the equipment shall be determined on the site as the work progresses. The Engineer reserves the right to alter the location of equipment a distance of up to ten feet without involving an extra providing that notice is given prior to the installation of same.

Provide foundations, supports, stands, platforms, etc., necessary for the proper installation of the work. They shall be concrete, masonry, steel, etc., as may be required and as approved by the Engineer or elsewhere shown or specified.

Provide hangers, inserts, etc., to support conduit and fixtures and equipment installed under the work of these sections and they shall be such that all items will be true in respect to alignment and structural elements. Methods of support to structures shall be to the approval of the Engineer.

Outlet and junction boxes etc., shall be supported independently of the conduits running to them.

Provide access for all junction boxes, and control panels.

Laminated nameplates (Lamacoid or equivalent) with black engraved lettering on white shall be supplied and installed under this Specification on all disconnect devices, pilot lights, conduit runs, and other control equipment installed under this Contract.

Submit a list of nameplates for approval before manufacture.

The pole line between the main service and the plant compound and the section of underground service line inside the plant compound shall be installed as shown on the Drawings and to the requirement of the authority.

Excavate as required for the work of this trade.

Be responsible for backfilling necessary for the work of this trade. Backfilling shall be to the standards set under Section 02200 or completed by the excavation Contractor. Provide concrete pads, bases, and encasements for the work of these sections.

D. BURNER CONTROL SYSTEM CONNECTION

Wiring shall be extended from the electrical room to control devices including, where necessary, underground or overhead cables to loads on the project.

The burner system control panel will be located in the electrical room adjacent to the motor control starters and the distribution equipment as shown on the Drawings. The power and control wiring will be run as shown on the Drawings to the remote flare stack, blowers, ventilation fans, heaters, dampers, instrumentation and services some of which are part of this section.

E. SYSTEM LOGIC

The logic and controls for the burner system are to be supplied by the manufacturer of the flare. The information from the burner system that is to be available to the blower control system is to consist of:

1. Burner ready - means that the flare is ready to accept gas from the landfill site and no fault exists.
2. Flare High Temp - means the flare is in over temperature and the blower must shutdown. This information will be passed to the central monitoring system.

Other information which become inputs into the Blower Control system are as follows:

Blower 1 operating, Blower 2 operating, Gate Emergency Button, N2 Station reset, Intruder Alarm, Feed Valve open and closed limit switches, CH4 at 20% and 40%, blower 1 and 2 Overloads.

The sequence of operation is as follows:

1. The operator starts the propane pilots on the flare and confirms that they are working.
2. The operator checks the nitrogen station and confirms that the N2 gas supply for the operation of the feed valve is available and then pushes the N2 reset pushbutton.
3. The operator returns to the electrical room and decides whether one or two blowers are required. The Blowers are selected for operation by turning the selector switch to the auto position. The manual position is only for maintenance and should never be used for normal running.

4. The operator resets the control system by pushing the Panel Reset. This gives the system time to confirm the existence of the correct operating states. He then pushes the blower start button and the blowers start to deliver gas to the flare. If the blower or blowers fail to start or the Gate station is not in normal state or the main feed valve is not open the system shuts down and the complete procedure must be repeated for restart.

5. The internal system timers are set to give the operator up to two minutes to start the blowers after the Nitrogen Reset Button is pushed. If the blowers or the system parameters are not met during this time delay shutdown will occur. Operation of the blower Start pushbutton without the system being reset will result in no action.

6. Shutdown of the system is instantaneous upon any of the system parameters going into a failure mode. The parameters which cause shutdown are:

   Blower Motor failure
   Loss of main flame
   CH4 at 40%
   Main gas Supply Valve not open
   Gate Station operated
   Startup Time Out
   High Temperature

7. The Exhaust fans can be operated either manually or automatically. The automatic mode operates either on a thermostat or the existence of a high level of CH4 (20% or greater). The exhaust fans are for room ventilation. The dampers operate only when the appropriate exhaust fan operates.

F. ADJUSTMENT COMPLETION

Test and operate wiring and electrical equipment before turning over to the Owner.

Provide the Engineer, receipts from Owners for loose components (e.g. fuses, portable equipment) which are to be furnished under this Division of the work.

Provide the Engineer with two copies of a list of all lamps used throughout the project, indicating wattage, voltage, ordering abbreviation and/or catalogue number and location.

1.04 MEASUREMENT AND PAYMENT

Payment for the electrical will be made at the lump sum price stipulated in the Form of Bid for Item 11 which price and payment shall be full compensation for supply and installation of all wiring and conduit; supply and installation of gas detection system; supply and installation of lighting and heating systems; supply and installation of main service connections, pole line and underground lines; supply and installation of all motor wiring; and all other miscellaneous items for which separate payment is not provided under other items.

CONTRACT NO. RHW 89-10(G)

SPECIAL PROVISIONS

RESPECTING

CONTINGENCY ALLOWANCE

A fixed sum of $80,000 dollars shall be included in the total bid for the performance of the Contract, to provide for payment for any extra or additional work of a contingent nature that the Commissioner of Engineering considers necessary to be performed by the Contractor during the course of work. The requirements of Ham. Form 200.02.05 shall apply.

The provisions of a contingency allowance shall not be construed by the Contractor as constituting a protection for him against any defects occurring in the work as a result of his negligence or employment of inferior materials and workmanship therein, nor shall it be looked upon as an available reserve to protect him against the usual hazards that may be expected to attend the execution of work of a nature such as that entailed by the project herein, adequate allowance for which must be anticipated by the Contractor and incorporated in his prices quoted for performing the units of work set out in the "Schedule of Quantities and Prices" of the "Form of Tender".

SPECIAL PROVISIONS FOR

CONTRACT NO. RHW 89-10(G)

LIQUIDATED DAMAGES AND TIME FOR COMPLETION

LIQUIDATED DAMAGES

1. TIME

Time shall be the essence of this Agreement.

2. PROGRESS OF THE WORK AND TIME FOR COMPLETION

The Contractor shall commence work in accordance with Section 200.05.02 of the General Conditions and shall complete it within 150 working days of the commencement date specified in the Notice to Proceed.

If this time limit specified above is not sufficient to permit completion of the work by the Contractor working a normal number of hours each day or week on a single daylight shift basis, it is expected that additional and/or augmented daylight shifts will be required throughout the life of the Contract to the extent deemed necessary by the Contractor to ensure that the work will be completed within the time limit specified. Any additional costs occasioned by compliance with these provisions will be considered to be included in the prices bid for the various items of work and no additional compensation will be allowed therefor.

Working time shall be charged until the date of acceptance of the work by the Engineer as specified in Section 200.02.07 and 200.02.08 of the General Conditions.

3. WORKING DAY

A Working Day is defined as any day:

a) Except Saturdays, Sundays and Statutory Holidays.

b) Except a day on which the Contractor is prevented by inclement weather or conditions resulting immediately therefrom adverse to controlling operations or operations, as determined by the Engineer, from proceedings with at least 60 percent of the normal labour and equipment force engaged on such operation or operations for at least (5) hours toward completion of such operation or operations. A controlling operation or operations is to be construed to include any feature of the work considered at the time by the Engineer which, if delayed, will delay the time of the completion of the Contract.

The Engineer will furnish the Contractor with a weekly statement showing the number or working days charged to the Contract for the preceding week, the number of workings days specified for completion of the Contract, and the number of working days remaining to complete the Contract. The Contractor will be allowed one week in which to file a written protest setting forth in what respects the said weekly statement is incorrect, otherwise the statement shall be deemed to have been accepted by the Contractor as correct.

4. EXTENSION OF TIME

Section 200.05.04 of the General Conditions shall apply in its entirety to these Special Provisions.

5. LIQUIDATED DAMAGES

It is agreed by the parties to the Contract that in case all the work called for under the Contract is not finished or completed within the number of working days as set forth in these Special Provisions, damage will be sustained by the Region and the parties hereto agree that the Contractor will pay to the Region, the sum of THREE HUNDRED DOLLARS ...... ($300.00) for liquidated damages for each day and every calendar day's delay in finishing the work in excess of the number of working days prescribed and it is agreed that this amount is an estimate of the actual damage incurred by the Region which will accrue during the period of excess of the prescribed number of working days.

The Region may deduct any amount due under this paragraph from any monies that may be due or payable to the Contractor on any account or contract whatsoever. The liquidated damages payable under this paragraph are in addition to and without prejudice to any other remedy, action or other alternative that may be available to the Region.

The Contractor shall not be assessed with Liquidated Damages for any delay caused by Acts of God, Acts of the Province or of any Foreign State, Fire, Flood, Epidemics, Quarantine Restrictions, Embargoes or delays of Subcontractors due to such causes.

If the time available for the completion of the work is increased or decreased by reason of alterations or changes made under Section 200.02.04 of the General Conditions, the number of Working Days shall be increased or decreased as determined by the Engineer.

If the time available for the completion of the work is increased or decreased because of an overrun of a major item in the Contract, the Engineer in his sole discretion, may increase or decrease the number of working days by adding or subtracting therefrom, as the case may be, a number of days calculated from the difference between the actual quantity and the estimated tender quantity divided by the average daily production of the most productive 50 percent of the working time shown on the Contractor's schedule provided that this basis for calculation may not be used where in the opinion of the Engineer, all or any of the relevant major items are carried out concurrently, and the decision of the Engineer shall be final.

SPECIAL PROVISIONS

Respecting

FEDERAL SALES TAX

And

ONTARIO RETAIL SALES TAX

1. FEDERAL SALES TAX

1.1 Sewer and Drainage Construction and Appurtenant Work

Tenders for sewer and drainage construction and appurtenant work will be considered only on a Federal Sales Tax excluded basis. Under Section 111 of the Excise Tax, municipalities are exempted from payment of Federal Tax on good purchased by them for their own use, and not for resale as part of a sewerage and/or drainage system.

The Department of National Revenue has ruled that where a municipality enters into a Contract for a sewerage or drainage system, and the Contract, together with all billings thereunder, specifies the charge for the materials and goods separate from the amounts for labour and all other charges, the Department will consider the Contractor as selling the materials and goods as such, to the municipality.

The successful tenderer on this Contract shall pay Federal Sales Tax, on purchases which he makes under the Contract, for incorporation in the permanent sewerage and/or drainage works, and may recover such Sales Tax by completing Forms N.15 and N.15A, obtainable free of charge from any Sales Tax Division Office, Department of National Revenue.

The Form of Tender for this Contract gives effect to the above stated exempting provisions, and must be complete exactly as directed therein. All spaces in the Form of Tender must be completed.

In the computation of each individual item price for insertion in the "Schedule of Quantities and Prices" - for sewerage and drainage and appurtenant construction - of the "Form of Tender", it is not necessary to show the charge for materials and goods separate from the amounts for labour and all other charges.

Special Note Re: Sewerage and Drainage Systems: -

If the Contractor purchases taxable goods from wholesalers, Sales Tax included, on which he is entitled to a refund, he may deduct 25 percent from his cost price of such taxable goods and submit a refund claim for 11/111ths of the balance. On similar purchases from retailers, the Contractor may deduct 50 percent from his cost price and submit a refund claim for ten percent of the balance.

1.2 Watermains and Water Service Construction and Appurtenant Work

All materials required for the performance of watermain and water service construction and appurtenant work are "EXEMPT" from Federal Sales Tax. All such tax shall be "EXCLUDED" in the total price for this work quoted in the "Schedule of Quantities and Prices" of the "Form of Tender".

1.3 Roadway, Sidewalk, and Alleyway Construction and Appurtenant Work

All materials required for the performance of roadway, (except the 300 mm wide section immediately adjacent to curbs, comprising the gutter) sidewalk, curb and alleyway construction, and appurtenant work are properly subject to Federal Sales Tax. All such tax shall be included in the total price for this work quoted in "Schedule of Quantities and Prices" of the "Form of Tender".

1.4 Curb and Gutter Construction

All materials required for the performance of cub and gutter sections of roadways (300 mm wide section immediately adjacent to curbs) are properly exempt from Federal Sales Tax. All such tax shall be excluded in the total price for this work quoted in the "Schedule of Quantities and Prices" in the "Form of Tender".

2. ONTARIO RETAIL SALES TAX

All prices tendered for the works shall included Ontario Retail Sales Tax.

The Ontario Sales Tax ruling states:

"the eight percent Ontario Sales Tax is applicable to all materials used to construct, repair or that is attached to real property but the eight percent Ontario Sales Tax is not applicable to the labour content of a Contract.

3. NON-RESIDENT CONTRACTORS

If the Contractor is non-resident in Ontario, he shall, immediately, after being notified by the Region that the Agreement has been executed by the Region, obtain from the Retail Sales Tax Branch a certificate showing that the Contractor has registered with the Retail Sales Tax Branch and shall submit such certificate to the Region at the same time that he furnishes the Performance Bond.

The Engineer may withhold the issuance of the order to commence work to a non-resident Contractor is the required certificate has not been furnished.

If the Contractor is non-resident in Ontario, he shall not commence work or order any materials or equipment for the Contract until he has submitted to the Region and required certificate.

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